THE GRAND FLEET

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THE KING AND ADMIRAL JELLICOE ON BOARD THE FLAGSHIP OF THE GRAND FLEET

THE GRAND FLEET

BY

H. C. FERRABY

WITH NINE ILLUSTRATIONS

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TO

C. N. R.

WHO TAUGHT ME

AUTHOR'S NOTE

THIS book will not interest the naval expert. It is not intended to.

It is a simple primer of naval knowledge, explaining in the easiest possible way the elementary facts concerning the ships that compose the Fleet, their duties in battle and out of it, and the respective "military significance" of each class.

My object in writing it has been to enable the shore-living citizen to understand quickly and easily those primary facts concerning the fighting force at sea, which I myself had to learn by long and devious ways. It is a remarkable fact that a maritime nation like ours should possess in all its literature no simple A B C of warcraft. There are many books about naval history, about naval strategy and about naval construction. There are many tabular lists of warships that are so much higher mathematics to the man in the street. There is nothing that tells him

what is a pre-Dreadnought, and why the Dreadnought is of greater fighting value than any other ship.

Experts talk glibly of *Queen Elizabeths* and *Goliaths*, of *Carolines* and *Diadems*, of "L" class destroyers and of "E" class submarines. What does it all convey to the man who has not read *Brassey's Annual* year after year?

My correspondence basket at the *Daily Express* office week in week out during the war shows that it all means blank bewilderment to the plain, ordinary citizen. That basket is the genesis of this book, and to the correspondents who have bewailed their ignorance, I offer my humble thanks for suggesting it.

H. C. F.

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THE GRAND FLEET

CHAPTER I

SQUADRONS AND FLOTILLAS

A NAVY is composed of many classes of ships of varying values, some for fighting, some for scouting, some for supply and some for repairs, just as an Army is composed of infantry, artillery, cavalry, A.S.C., flying corps and other services.

The first sub-division of a national army is into separate armies, numbered consecutively. The first sub-division of a navy, however, is into fleets. Each fleet theoretically comprises vessels of all classes, but in the course of the present war we have made one exception, the Battle-Cruiser Fleet, something quite new in warfare, and this comprises every kind of ship except one—the principal ship in the Navy, the battleship. The reason for this is that the battle-cruiser is so nearly a battle-

ship that it can head a fleet of its own. It is a "capital," or chief, ship, as is more fully explained in Chapter II.

The main fighting force of the Navy is gathered together in the Grand Fleet. That has not always been its title. For some years past the squadrons in the North Sea and the Channel had been called the Home Fleets by the Admiralty. When Sir John Jellicoe first hoisted his flag, he followed that nomenclature, but he had not been in command three weeks before he publicly altered the name of his command, and revived the fine old historic phrase "Grand Fleet." This was in his message of congratulation to the Army on the brilliant retreat from Mons.

The Admiralty would have none of it. The Home Fleets was in the Navy List, and the Home Fleets it must remain. There was a faint sign of weakening when a submarine attacked one of our squadrons in the North Sea and was rammed by the *Birmingham*. Then the Secretary of the Admiralty's announcement referred to the "Main Fleet." That, however, was an ugly phrase, and the Admiral scorned the compromise.

Even the Court newsman sided with the

rebellion, and the *Court Circular*, in March 1915, stated that the King had been on a visit to a portion of the Grand Fleet. That undermined the Admiralty's position badly. When the Archbishop of York and the Prime Minister respectively disappeared into the northern mists to see the ships, the official communications were allowed to speak of the Grand Fleet, but when there was any fighting to be done, we were promptly hurried back to "Home Fleets." Sir Dudley de Chair's despatch on the work of the blockading cruisers in the *London Gazette* in November 1915 was preceded by an official note to the effect that the "Commander-in-Chief, Home Fleets, speaks in the highest terms of the manner in which the patrol cruisers have done their work."

Quite quietly, in the end the Admiralty gave up the fight. Dr. Macnamara introduced into the House of Commons in May 1916 a Bill to amend the Naval Discipline Act as regards certain powers appertaining to the office of the "Commander-in-Chief of the Grand Fleet." Mr. Balfour backed the Bill (which is of no particular public interest apart from the mere presence of those two words,

" Grand Fleet ") and the officials' surrender was complete.

The phrase itself dates back more than two centuries, to the time when the lessons of Drake and the Elizabethans had been assimilated by the rulers of England, and the influence of sea power on history had begun dimly to be sensed. Then the Grand Fleet of Britain was that squadron which was employed on the most important work, work which took it in those days far from home waters, to spend long months in the Mediterranean. The sailors' songs of those days, which have been preserved, speak of " The Grand Fleet," so that the term was in common use.

As our power at sea grew, and the need for scattered squadrons in many oceans led to dispersion of ships under various admirals, the phrase tended to die out, and the name " Channel Squadron " arose to describe that force most nearly concerned with home defence.

" Home Fleets " is a modern phrase, and is the outcome of muddled thinking. The main strength of Britain at sea came to be concentrated in home waters ten years ago, because

the main threat to our power at sea was concentrated near those waters, and not because the British Empire could necessarily be best defended near to the shores of Britain.

Sir John Jellicoe soon saw through the error and corrected it. The public followed his lead without in the least understanding why, though perhaps the innate common sense of a race of seafarers told them instinctively that his was the right title. Also there is a clang and a music about the phrase that is wholly lacking in the prosaic "Home Fleets."

The Grand Fleet is subdivided into squadrons of battleships and cruisers, and into flotillas of torpedo-boat destroyers.

Note carefully this distinction between squadrons and flotillas: the first term is applied only to groups of heavier surface ships; the second is used to describe groups of light craft and submarines. Just as it would be wrong to talk of a gaggle of buffalo and a herd of geese, so it would be wrong to speak of a flotilla of battleships and a squadron of destroyers.

The squadrons of heavy ships are distinguished by numbers preceding the des-

cription of ships composing the force. Thus in Sir John Jellicoe's despatch on the battle of Jutland we read of the

First Battle Squadron,
Second Battle Squadron,
Fourth Battle Squadron,
Fifth Battle Squadron.

These are squadrons of battleships.

Then we get the three Battle-Cruiser squadrons.

Next in importance come the Cruiser Squadrons.

They are followed by the Light Cruiser Squadrons.

In each case they are First, Second, Third or Nineteenth as the case may be. The numbering of them is elastic and depends solely on the quantity of ships in service.

A Battle Squadron consists of eight battleships under the command of a Vice-Admiral, with a Rear-Admiral as second-in-command. The Vice-Admiral is in one ship and the Rear-Admiral in another, and each of them theoretically heads a line of four ships. In the course of tactical movements, naturally their respective positions may change—thus they may bring up the rear of each line at one time,

and an hour later the Rear-Admiral's ship may be at the head of one single line of eight ships with the Vice-Admiral's ship fifth in the line. That, however, does not affect the organisation and work of the squadron.

The same thing applies to a Battle-Cruiser Squadron.

A Cruiser Squadron is under the command of a Rear-Admiral, and he does not usually have a second-in-command. A Cruiser Squadron should nominally consist of four ships, but in practice the number varies according to the requirements of the Fleet to which the Squadron is attached, and according to the number of cruisers available for service with the navy all over the world.

Thus, Rear-Admiral Cradock's Cruiser Squadron at the Battle of Coronel was made up of three distinct types of ship—the armoured cruisers *Good Hope* and *Monmouth*, the light cruiser *Glasgow*, and the auxiliary cruiser *Otranto*. Then again before the war the Tenth Cruiser Squadron consisted of eight ships, while the Eleventh Cruiser Squadron had five and the Fifth only three.

All this may seem very confusing, but it is quite simple if it is borne in mind that a

Squadron is a unit under the command of one man, just as a battalion is a unit, whether it be at full strength, or whether 600 of its officers and men be away as casualties or on leave.

Much the same thing applies to the flotillas of destroyers and submarines. Nominally there should be sixteen ships to a flotilla, with one or more light cruisers or "flotilla leaders" for the officers in command of the flotilla and its sub-divisions. But flotillas do occasionally include as many as twenty-three or as few as thirteen destroyers or even as few as six submarines.

This is all part of the elasticity of the Navy. Rules are made for guidance and not for pedantic adherence in the Senior Service. Many decades ago our admirals were hide-bound in their obedience to certain "Fighting Instructions" drawn up by the Admiralty. The result was that we either lost battles, or had to be content with inconclusive fighting. The lessons of these mistakes have not been lost on the modern Navy.

There is to me always something noteworthy in the difference between a score of naval men and a score of army men when on

parade. The naval men are just as disciplined, just as alert and just as exact in every movement as the army men. But they are also more elastic, less taut, less stereotyped—however you like to phrase it. They give one the impression of men who could do the unexpected thing without orders.

That is characteristic of the whole organisation of the Navy of to-day. A Battle Squadron ought to consist of eight battleships, but if there are only seven available they will not hang about in port for the eighth to be completed. She can join up when she is ready—or go elsewhere if the needs of the service require it. The seven will carry on quite comfortably without her.

It will be noticed that nearly all the theoretic figures I have mentioned are multiples of four. This is purely for convenience. It has been found in practice that four is a sub-division of ships which can most conveniently be handled.

There is one other division of ships that must be mentioned, the "attached ships." These are mostly small craft (light cruisers or destroyers) *de*tached from their proper squadrons or flotillas and *at*tached to the big

ships as messengers, scouts, signal-repeating ships and general utility craft. Other ships usually attached to the Battle Squadrons are mine-layers and mine-sweepers. Then, too, there are repair ships—which are practically floating-workshops—seaplane-carrying ships, distilling-ships and fleet-messengers. Most of these are described in detail in Chapter X, which deals with auxiliary vessels. They are all war-craft, they are all vitally important units of a modern Fleet, but they are not fighting ships. The work they do is seldom or never mentioned in despatches.

We have now got an approximate idea of the composition of a Fleet and of the various types that are needed. The ensuing chapters explain the functions of each type, but before we pass on to that aspect of the Fleet in Being we may just pause to consider very briefly and very simply the handling of flotillas and squadrons at sea by the admirals and senior officers in command.

There are three main formations which will be met with in most of the despatches describing the fighting at sea :

(1) The line ahead or the line of battle.

(2) The line abreast.

(3) The line of bearing.

The line ahead is Indian file; one ship follows another at an exactly prescribed distance.

The line abreast is line ahead turned at right angles with all the ships of the division "dressing by the right" like a platoon.

The line of bearing is a diagonal line ahead, each ship being slightly to the right or left (starboard or port) of her next ahead, but of course at the prescribed distance behind. The object of this disposition in modern times is to keep each ship clear of the smoke and flurry of the ship in front.

It will be seen that the last two dispositions are variants of the first. That explains why line ahead is also called the line of battle. It is the most important formation: it is the one most favoured by all naval tacticians for the giving of battle, and it is the basis of all tactical movements by a fleet or a squadron.

The line ahead, however, does not necessarily mean that every single ship in the fleet is exactly behind another in one long line. That is done by a signal for "single line ahead." There is also "columns of line ahead," in which each sub-division of the

squadron (not of the fleet, be it noted) follows its flagship in line ahead, but the two flagships are abreast of each other, and the "opposite numbers" of each division are side by side behind the flagships. Thus you get the formations shown in the illustration

Naturally in the formations "line abreast" or columns of line ahead, the Commander-in-Chief's ship or column need not necessarily be the right-hand (or starboard) one. It is just as easy for it to be on the left-hand (or port) side.

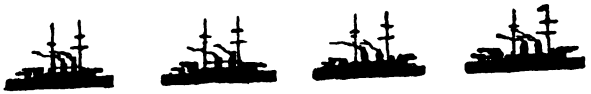
Change is made from one formation to another by turning a given number of points.

Eight points turn takes a division from line ahead to line abreast (or through a right angle).

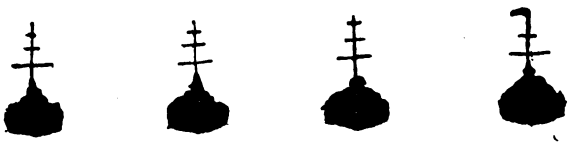
Sixteen points turn takes a fleet right back on its tracks—that is, if the ships are steaming north and turn sixteen points they will head south.

Thirty-two points turn brings the ships back to exactly the formation and direction they were in when they started the manœuvre.

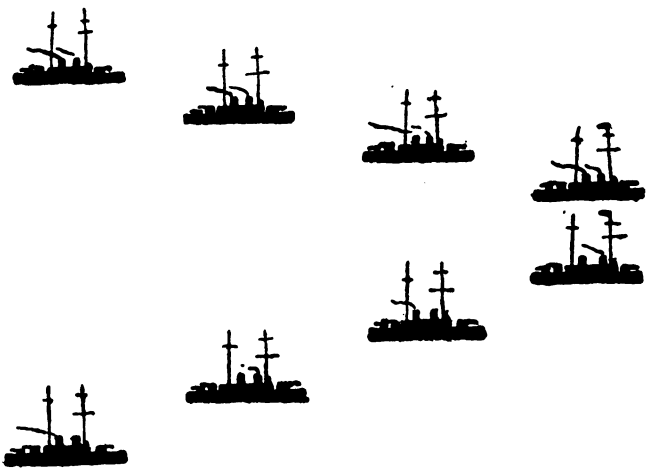
These are the elementary formations and movements in a fleet, or a squadron, or a flotilla at sea. Anyone who will take the



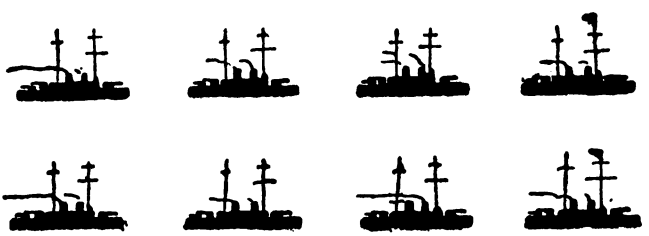
LINE AHEAD.



LINE ABREAST.



LINE OF BEARING



COLUMNS OF LINE AHEAD.

trouble to understand thoroughly what I have written, and will then read through the despatches of the battle of Jutland, will find that what was formerly chaos becomes a clear picture of the various manœuvres of the two opposed fleets. There are very few naval despatches that cannot be deciphered with the aid of these few simple indications.

CHAPTER II

"CAPITAL" SHIPS

BATTLESHIPS and battle-cruisers are the principal ships of any navy. They are the "capital" or head ships. They are the craft on which the brunt of any pitched battle falls. It is true that experts are still divided about the value of the battle-cruiser in battle, but we are not concerned here with experts. There is such a thing as a battle-cruiser and we must consider her solely as a ship and not as a peg for theories, even while we admit that in her present development she is slightly inferior to the battleship.

The battleship is the "heavy-weight" of naval warfare. The heavy-weight boxer depends more on the strength of his own blows and the security of his defence than on his speed in moving about the ring. That is more an attribute of the light-heavy-weight to whom may be compared the battle-cruiser, or of the middle-weight to whom the ar-

moured-cruiser bears some resemblance. The light-weights are the light-cruisers, the fly-weights are the destroyers.

This sporting comparison may do something to fix permanently in the mind of the student-beginner the respective strengths of the types of ship we have to deal with.

No long disquisition on the evolution of the battleship is needed here. The battleship of to-day is materially a totally different thing from the line-of-battleship of Trafalgar, but strategically there is no difference whatever. The function of the *Iron Duke* is the same as the function of the *Victory*: it is only the means by which the end is achieved that has altered.

Battleships of to-day are divided into two kinds, the so-called Dreadnoughts and the pre-Dreadnoughts, and this is in itself a sufficient source of confusion for the untutored without the further (and purely journalistic) sub-division of Dreadnoughts into super-Dreadnoughts and hyper-super-Dreadnoughts.

How did the distinction come about and what does it mean?

The division began in 1906 with the evolu-

tion of a novel design in battleships. The first of the new class was called the *Dreadnought*. It outclassed all the earlier designs so completely that it was no longer reasonable to describe the old and the new both as battleships. A distinctive title was wanted for the later type, and it came to be usual to speak of the battleships built after 1906 as "Dreadnoughts," and to class all other battleships as pre-Dreadnoughts. It was an arbitrary distinction, because there was nearly as much difference between the *Majestic*, built in 1895, and the *Lord Nelson*, built in 1906, as between the *Dreadnought* and the *Lord Nelson*, which were both built in the same year. Age has some influence on the fighting value of a battleship, despite the useful service to which all our old ships of the late Victorian era have been put during the war.

The distinction, however, had to be made, and although the term "Dreadnought" has never been more than semi-official, it is now accepted all over the world as the synonym for a battleship of modern design.

What is that design? How is it different from that of earlier battleships?

The answer is to be found in a general increase all round of that quality in a fighting machine which we call "offensive power."

Pre-Dreadnoughts carry four large guns of 12-inch calibre, and a large number of small guns of all sizes from 9·2-inch down to 4-inch. These are generally spoken of as the "secondary battery."

The *Dreadnought* carries ten 12-inch guns, and then has no pieces of small calibre until we get right down to the twenty-four 12-pr. pieces that are intended to drive off attack by torpedo craft, the fly-weights.

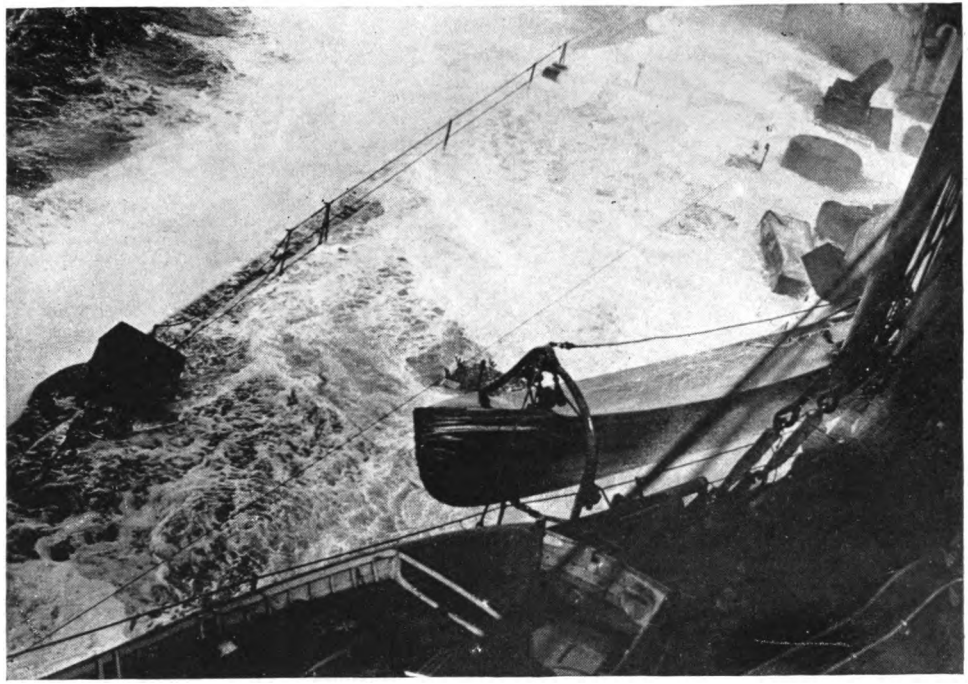
She is what is called "the all-big-gun" battleship. She was, when built, the epitome of specialisation in naval warfare. The battleship was intended to hit, and the *Dreadnought* carried hitting power to the *n*th degree. There was no waste of space, of men and of money on secondary armament. Everything was simplified down to the biggest gun with the greatest hitting power in the greatest possible number.

Other features of the Dreadnought-design, over which much ink was spilled, were her turbine machinery, her speed, and her tripod-masts. They have all proved to be only

stages in the development of men-of-war generally. The naval engineer of to-day will tell you that so far from turbines being the last word, the internal combustion engine (the motor, in popular terms) is a perfectly possible development in the machinery of battleships and battle-cruisers before many years are past. The speed of the *Dreadnought* is as nothing to the speed of the *Queen Elizabeth*. But the basic idea, the all-big-gun armament, has spread all round the world.

When war broke out in 1914, Great Britain was beginning the construction of five more battleships, each carrying eight 15-inch guns, and with an anti-torpedo craft battery of twelve 6-inch guns, this last development on the *Dreadnought's* armament being necessitated by the growing size and strength of torpedo craft. These were the vessels sometimes referred to as hyper-super-Dreadnoughts, a clumsy way of saying that they were improvements on the type-ship.

How is the man in the street to know a Dreadnought from a pre-Dreadnought? The date of construction is not a safe guide, because, as I have mentioned already, the *Dreadnought* and the *Lord Nelson* were both



DECK OF A DREADNOUGHT IN HEAVY WEATHER

built in the same year and are yet in either category. The only way I know of is by memory, and to that end I have compiled alphabetical lists of the ships in each class as they were officially admitted to exist in the British Navy on July 1st, 1916. Any name which may crop up in the future that is not in these lists may be unhesitatingly added to the list of Dreadnoughts, since it stands to reason that we are not building pre-Dreadnoughts any more.

PRE-DREADNOUGHTS

Africa
Agamemnon
Albemarle
Albion
Britannia
Cæsar
Canopus
Commonwealth
Cornwallis
Dominion
Duncan
Exmouth
Glory
Hannibal
Hibernia
Hindustan
Illustrious
Implacable
Jupiter
London
Lord Nelson
Magnificent
Mars
Prince George
Prince of Wales
Queen
Triumph
Venerable
Vengeance
Victorious
Zealandia

DREADNOUGHTS

Ajax	Monarch
Audacious	Neptune
Barham	Orion
Bellerophon	Queen Elizabeth
Benbow	Ramillies
Centurion	Resolution
Collingwood	Revenge
Colossus	Royal Oak
Conqueror	Royal Sovereign
Dreadnought	St. Vincent
Emperor of India	Superb
Hercules	Téméraire
Iron Duke	Thunderer
King George V	Valiant
Malaya	Vanguard
Marlborough	Warspite

It is to be noted that I have not attempted to sub-divide the ships into various classes. Thus among the Dreadnoughts I have lumped together those carrying 12-inch, 13·5-inch and 15-inch guns without distinction. Such niceties are not the business of an alphabet of warcraft. They are for the more advanced student.

There are no longer any such things as "ironclads" in any navy. How can there

be when ships are no longer "clad in iron" but are built of steel?

The ironclad properly speaking had a very brief existence. The first armour-plates were of wrought iron and were fixed round the sides of wooden ships. The French *Gloire* (1855) was the first to be thus fitted, closely followed by the British *Warrior* (1860). Steel armour plates began to be substituted for the iron about 1878, and have since held the field unchallenged, being improved, year by year, by such men as Harvey in the United States (1891) and Krupp in Germany (1894), with more recent changes that cannot yet be particularised. The rapidity with which armour improves, however, is indicated by the statement of one of the leading British warship-builders that the 8-inch armour of 1906 was more than equal to the 12-inch armour of 1902.

The amount of weight used up by the armour protection of a modern battleship is very considerable, amounting in some instances to as much as 6000 tons. There are only a few firms who can make armour-plates, and the price is consequently high. It is believed to be about £90 a ton. It will be

seen therefore that the protection of a battleship without any provision for fighting power alone amounts to some £540,000. Sufficient armour-plate can be produced in Great Britain in one year to build ten battleships or battle-cruisers.

The battle-cruiser differs from the battleship only in this—that her speed is much greater, but her gun power and her armour protection are less. This is shown by the following table :

BATTLESHIPS

	Speed.	Guns.	Main Armour.
Collingwood .	21·5 kts.	ten 12-inch	11-inch
Iron Duke .	22 kts.	ten 13·5-inch	12-inch
Benbow . .	21 kts.	ten 13·8 inch	12-inch

BATTLE-CRUISERS

Indefatigable .	25 kts.	eight 12-inch	7-inch
Lion . .	28·5 kts.	eight 13·5 inch	9-inch

The Battle Cruiser Squadron of to-day corresponds to the advanced squadron that Nelson wanted for the complete realisation of his plan at Trafalgar. He proposed to have " eight of the fastest sailing two-decked ships " as a flying wing to be added to either

of the battle squadrons, as he found that the flinging in of extra strength was required.

The two-decker was a 64-gun ship as compared with the 98-gun and the 74-gun ships that formed the first line-of-battle. It will be seen therefore how close the analogy is. Nelson was never able to put his plan into practice for lack of sufficient ships. It was left for the Navy of a hundred years later to prove with wholly different material that his idea was tactically sound.

CHAPTER III

ARMOURED CRUISERS

BEFORE the coming of the battle-cruiser design, the principal type of cruiser was the armoured cruiser.

This was not intended to take any prominent part in engagements between battleships. It was simply a heavy well-armed scouting ship useful also for such duties as convoy, or for the patrol of trade routes to protect merchant ships against attacks by enemy cruisers.

The impossibility of using armoured cruisers with any hope of success in a big fleet action was all too dramatically emphasised in the battle of Jutland. Sir Robert Arbuthnot's Armoured Cruiser Squadron, including the *Defence, Warrior* and *Black Prince,* was observed " passing down between the British and German Battle Fleets under a very heavy fire."

The fate of the *Defence* is thus laconically described by Sir John Jellicoe :

" *Defence* disappeared."

She was a ship of 14,600 tons, but her main belt of armour was only six inches at the maximum. At a range of 5000 yards (just under three miles) the 12-inch guns of a German battleship can send shells of 850 lbs. right through 13½ inches of armour. At 8000 yards (4½ miles) they can penetrate 8-inch armour. What chance, then, had the *Defence*, the *Warrior* and the *Black Prince* with their six inches of protection of standing up to the punishing fire of the heaviest German ships ?

None of the principal Naval Powers is any longer building armoured cruisers. Just as in the design of the Dreadnought there was nothing between the big 12-inch gun and the little 12-pr., so the tendency in the past ten years has been to have nothing in ships between the big battle-cruisers and the little fast scout.

All the same our armoured cruisers built before the Dreadnought era began have done very useful work in this war. They have convoyed scores and scores of troopships across hundreds of miles of ocean. They

have patrolled the outer seas in search of contraband. They have "shown the flag" in out-of-the-way parts of the world, where it was desirable to impress the population with the knowledge that the British Navy ruled the seas.

These were all tasks for which the Dreadnoughts could not be spared. They were all tasks that required fair-sized ships of good sea-keeping qualities. Patrol vessels are no good for work in distant seas if they have to run to port for coal every few days. Convoy ships must be able to stand up to weather that the troopships can fight their way through. And the "naval ambassadors" to native ports must be sufficiently imposing to make an impression on the mind of the people visited.

French naval opinion, which has always been inclined to favour the small craft against the big, is bent at present on the evolution of a "convoyer" design. The French naval authorities have made considerable use of the small 300-ton torpedo boats in the Mediterranean for convoying troopships and guarding them against submarine attack during the war, and the success of those diminutive

protectors has somewhat deranged the focus of French naval students in envisaging the problem of the future.

It is assumed that all attacks on convoys in any naval war will be made by underwater craft, and that therefore the convoyer must be a vessel of reduced displacement, high speed and comparative invulnerability to torpedo attack.

The premise is false, and the deduction consequently equally false.

It cannot safely be assumed that a naval war in the future will see the experience of the European War repeated, with one belligerent fleet completely encircled and confined to its own waters, except for stray submarines. Geographical conditions alone may prevent such a repetition of history. In that case attacks on the transports of one belligerent by the large surface cruisers of the other may easily be made, and if those transports are only convoyed by small craft of the torpedo boat type, these will be quite inadequate to tackle the attackers and the transports will all be lost.

This one subsidiary aspect of sea war serves to show how very complex is the whole

question of the composition of a navy. Many functions have to be carried out by men-of-war in the course of a great struggle: it is the business of students to see that, so far as the resources of the nation allow, the craft apt to those functions are provided in peace time. It is for students too, by frank interchange of ideas, to see to it that money is not frittered away on inadequate types.

There is little likelihood that British naval constructors will be misled in this question of convoyers. Our experience in the war has not been confined to such circumscribed waters as the Mediterranean, and out of that experience we shall evolve a new design that will approximate, I believe, to the armoured-cruiser, without that type's vulnerability to underwater explosion.*

Another function filled by the armoured cruiser and more still by the light, or protected cruisers in the war was the chase of enemy ships that were bent on destroying the seaborne commerce of the Empire.

In all the miscalculations that marked the German plan of campaign, none was more curious than the breakdown of the projected

* See *post*, p. 57.

onslaught on British seaborne commerce. Within the first eight days of hostilities the Admiralty announced that British merchantmen were plying on the Atlantic routes with the same certainty as in times of peace, and the justification for that boast is to be found in the fact that on every ocean of the world the German cruisers and corsairs captured and sank only twelve British merchant vessels, averaging under 5000 tons each, between August 4 and September 23, 1914. It is highly probable that this result caused as much astonishment in Berlin as here, and naturally considerably more chagrin. For war on our overseas trade was to have been one of the trump cards in the German game, and in its way it was a subtle scheme, even though the egregious Bernhardi had given it his blessing.

Panic and democratic Government were the twin ideas on which it was based, and it was a plan that could only succeed against a country like Great Britain, a maritime nation fed and supplied from overseas, in which not one man in 200,000 of the civil population has the faintest inkling of an idea of what a navy is or what it does, what its true rôle is

in war, or what are the elementary principles of naval strategy.

By striking at the food-supply, hard, swift, dramatic blows, Germany calculated that she could start an outcry in this country against the strategical disposition of the British Fleet. She counted on the psychology of fear to cause a clamour for every ship in the Fleet to be sent to the ends of the earth in chase of the enemy cruisers and armed liners that were preying on our food-carriers. Democratic government gives the people's voice a certain weight even in moments of crisis, particularly with a certain type of politician: that clamour, if sufficiently insistent, might have led to such a dispersal of the British sea forces that the German fleet could have sallied forth to give battle to individual segments, and would have overcome them one by one, since her united forces would in every case have been superior to the scattered British divisions.

This was perhaps the only item in their plan of campaign in which the German General Staff showed any understanding of the British character. If any say I libel my fellow countrymen's intelligence, I refer them

to history—to the fact that at the very time Hawke was chasing Conflans to bring him to battle, his effigy was being burned in London by a populace that failed utterly to understand why he had not long before accomplished that task. I refer them to the protest of the merchants of London in the Napoleonic wars against Nelson's retention of the main fleet in the Mediterranean because they feared invasion—not knowing that while Napoleon's fleet was contained by the British in Toulon Napoleon's army must remain idly encamped on the heights above Boulogne.

These are matters of record. They are things that our fathers did before us—and the British nation is eminently conservative.

The German plan failed, however. Where peace manœuvres had shown us that a daring enemy with fast ships ought to be able to capture at least one-third of our shipping in the Atlantic during the first fortnight, war showed us only his own ships scuttling into every neutral port, and ours, after a three days' pause, proceeding, with caution but without much fear, upon their lawful occasions. So Sir John Jellicoe was left with undiminished forces in the North Sea.

Three factors contributed to the breakdown of the plan.

The first was the readiness of the British Fleet, which rendered difficult the escape from German ports of either light cruisers or fast armed merchantmen into the Atlantic.

The second was the strict insistence on neutrality by the United States, which resulted in fifteen liners, capable of being armed on the high seas, remaining interned in American ports.

The third was Germany's total lack of coaling-stations.

What, on the other hand, was the effect of the British trade route patrol on German shipping ?

British men-of-war captured and took into port 101 German merchantmen : another 102 were detained in British ports at the outbreak of war. France and Russia detained or captured 168 vessels.

That was the first visible tangible result of the patrol. But there was a far greater result than that.

Only one German merchantman of a peaceful nature attempted to cross the Atlantic in the first two months of the war.

That was the North German Lloyd steamer *Neckar*. She left Havana shortly after war had been declared in an endeavour to reach Bremen. For seven weeks she was hunted about the Atlantic, once getting so near home as the north coast of Scotland, only to be headed back again by a British cruiser. The captain ultimately gave up the attempt and went into Baltimore Harbour, prepared like all the rest of the German mercantile marine to lie up for the duration of the war.

The British trade route patrol had another effect that is well worth bearing in mind. Germany's extensive emigration policy had resulted in an exodus to foreign countries of men who were of military age and were numbered among the available reserves. The complete stopping of German shipping, and the fact that reservists travelling in neutral ships were seized if the vessel was boarded by a British naval officer, or touched at a British port, prevented those men returning to join the colours, and the German army in all probability was weaker by five army corps than it would otherwise have been.

These results were not achieved, however, without great exertions by officers and men

of the Fleet. The impenetrable veil of secrecy, behind which necessarily the naval operations of the war have been conducted, has not allowed the general public to become aware of the extraordinary strain which has been thrown on the personnel. Those who have devoted some study to naval matters have been able, from little signs here and there, to draw certain deductions, and those who have friends in the service have received occasional illumination from hurriedly scrawled notes.

The only official indication of the extent of the work done was contained in a report by the Australian Minister of Defence, who stated that the Australian light cruiser *Melbourne* had steamed 11,170 miles between August 1 and September 12, 1914, covering the trade routes in the Pacific "mostly in the tropics." That means that she steamed 240 miles a day at an average speed of ten knots, and is a striking testimony to the efficiency of her engine-room staff.

The British light cruiser *Bristol* steamed 22,610 miles between August 4 and December 8, 1914. She steamed to and fro in the South Atlantic, endless week after endless week, with but one brief glimpse of an enemy ship,

the German light cruiser *Karlsruhe*, with which she exchanged shots at a great range for a few minutes. Although she had the luck to be in the Falklands fight, her prosaic lot was to be detached for the capture of the two German transports, the *Santa Isabel* and *Baden*, which offered little opportunity for either battle or honour. Then followed the weary freezing search for the *Dresden* among the thousand inlets of that desolate region, Southern South America, and even then the *Bristol* had no luck. It was the armoured cruiser *Kent* who gave the German corsair the knock-out blow.

Throughout that time whether on the equator or the near neighbourhood of the Atlantic everything was in readiness for action, ammunition by the guns and all night long men, too, ready for anything. The only variations were days when they hurriedly coaled ship in a port, or from a collier alongside at sea. Time and again they were sent dashing off to some wild islet or inlet on a false scent. The one "prize" sent in for examination proved to be innocent.

The crew of the *Bristol* were exactly twelve months in the ship without shore leave, and

with only irregular and occasional mails. At one time they were six weeks without being able to send a letter home.

Letters from naval officers on the trans-Atlantic route have contained such phrases as—

"I have just had a pair of pyjamas on for the first time in six weeks."

CHAPTER IV

LIGHT CRUISERS

WE have been a long time evolving the ideal light cruiser, but in the months just before the outbreak of the Great War we were engaged in the construction of several vessels of a new design that has, under the stern test of the Real Thing, proved to be very nearly ideal.

The light cruiser is the naval counterpart of the aeroplane. It must be very fast. It must be able to put up a fight against enemy small craft, but above all it must be able to dash up to approaching enemy squadrons, gather information and dash away again uninjured with its knowledge.

We have a splendid example of this in the Battle of Jutland dispatch, where Sir John Jellicoe says :

" At 5.30 p.m. this (Third Battle-Cruiser) Squadron observed flashes of gunfire and heard

the sound of guns to the south-westward. Rear-Admiral Hood sent the *Chester* (Captain Robert N. Lawson) to investigate, and this ship engaged three or four enemy light cruisers at about 5.45 p.m. The engagement lasted for about twenty minutes, during which period Captain Lawson handled his vessel with great skill against heavy odds, and although the ship suffered considerably in casualties, her fighting and steaming qualities were unimpaired, and at about 6.5 p.m. she rejoined."

The *Chester* is a modern light cruiser completed since the War began. The *Arethusa* which figured so prominently in the fighting until a mine ended her career was another.

The fast light cruiser of to-day is the triumph of the naval engineers more than of the naval constructors. It is the enormous improvement in the machinery that drives ships, the evolution of the turbine into the super-heated turbine, and the solution of the problem of the oil-fuel-burning furnace that has made possible the extraordinary fast ships of to-day to replace the 23-knot vessels of the *Topaze* class of 1905.

The nominal speed of the *Arethusa* type of light cruiser is 29 knots. What they have really done on service we do not know, but we have the admirals' dispatches to tell us that they have exceeded their designed speed.

The difference that ten years' progress in engineering has made in our light cruisers is shown most remarkably by a comparison of the horse-power developed by the *Topaze* of 1905, and the *Calliope* of 1915. The former's engines developed 9800 horse-power, the latter's machinery achieved 40,000, which is double the horse-power of a battleship of 1905.

These new light cruisers are a development on all their precursors also, in that they have a belt of armour. It is true that it is only three inches thick at the most, but it extends right fore and aft and goes some distance below the water-line. This protecting belt serves to keep out practically all projectiles from guns smaller than 6-inch, and at long range even the 6-inch shell will beat uselessly against the belt.

The reason for this is to be found in the name which Mr. Churchill applied to these

cruisers in a speech when he was at the head of the Admiralty. He called them, "destroyers of destroyers."

This is a new function for the light cruisers, additional to their work as scouts. They must act as a screen for the big ships against massed attacks by the enemy's light craft. Their speed is to enable them to catch even the fastest destroyers. Their 6-inch guns are heavier than anything mounted in any destroyer yet built. Their protection enables them to defy gunfire from destroyers. Their size gives them good sea-keeping qualities, and even in weather that drives the best ocean-going destroyers into shelter, the new light cruisers can carry on, in discomfort certainly, but in safety.

The coming of some such type was clearly in the mind of Lord Fisher when he made the historic clearance of scores of our light cruisers some years ago, a step that was denounced as the "scrap-heap policy." He realised, as his critics did not, that these old slow ships, antiquated in machinery and in guns, were not equal to fighting in a modern war, and that they were really death-traps for their crews. The case of the *Pegasus*

destroyed by the *Königsberg* at Zanzibar is a striking instance of this. She was one of those condemned to the scrap-heap and then restored to service. She was caught by the German cruiser while at anchor in Zanzibar "cleaning her boilers and repairing machinery." She was, of course, an easy prey : twenty-five men were killed and eighty wounded out of her complement of 234, and the ship herself was reduced to a blazing wreck in fifteen minutes.

Ten years ago, at a time when a particularly clear-sighted Board of Admiralty was in charge of the Navy, it was decided to remove all the useless death-traps of old ships that were used to "show the flag" on outlying stations. The *Pegasus* and all her class, built in 1897, were typical examples. Mr. Balfour put the matter very bluntly when he said that a ship which possesses neither fighting power nor speed is merely a ship that exists to embarrass British admirals and to discredit the British flag in time of war. It was hoped when this scrap-heap policy was initiated to proceed with the immediate construction of sufficient modern fast lightly-armoured cruisers to

replace them, for the purpose of commerce protection.

Political influence, into which it is unnecessary at the present time to enter, made the completion of those plans impossible. For one thing the Admiralty was faced in those days, when we did not spend £6,500,000 a day on national defence, with the problem of providing, on very restricted Navy Estimates, programmes of great battleships and battle-cruisers that were the prime necessity, and also all the minor craft that foresight demanded. The cost of the new types of big ships, however, was so great that both demands could not be met. Big ships or small ships had to give way for the time being, and the small ships waited. A number of the condemned ships had to be restored for "police work," which diplomatic and other reasons require the Navy to undertake in peace time.

But war time came and found those old tubs still on their beats; every fast modern cruiser was wanted in the main areas, and so the *Pegasus* had to go on doing her job, as a dozen more crocks have been doing on the outer parts of the Empire, patching themselves

up every now and again, their engine-room staffs doing deeds of heroism every day that no one will ever hear of, their officers and men easy "cannon meat" if enemy cruisers ever met them.

It will have been seen from these two chapters that the armoured-cruisers and the older light-cruisers were both employed on much the same work, particularly in so far as the trade-route patrols are concerned. This is a wasteful procedure. I indicated on page 42 my belief that a new type of light cruiser will be evolved for the duty of convoying troopships. That type will also serve for the protection of trade routes. It will be half-way between the old armoured cruiser and the new lightly-armoured cruiser. It will be a fast, fairly large and reasonably inexpensive ship.

The war has certainly taught us that the safety of our overseas trade can only be wholly guarded by speed and by numbers. For every 27-knot cruiser that the enemy possessed we wanted two—one to serve with the Battle Squadrons as a scout, one to patrol trade routes. Germany built twelve such cruisers in the seven years before the war at the cost of

about £3,600,000. We built sixteen cruisers, each at least 2 knots slower, at the cost of £5,600,000.

And the enemy's faster cruisers sank British merchantmen worth some £3,000,000. A slightly higher insurance premium was evidently required to cover all the risks.

CHAPTER V

DESTROYERS

THERE are three kinds of torpedo craft, which appeared on the scene in the following order :

Torpedo-boats.

Torpedo-boat destroyers.

Submarines.

The first is now out of date. The second is at the zenith of its power in the opinion of many people. The third has yet to develop.

The name of the first two classes indicates pretty clearly the functions they fulfil. The first was built to carry and fire the torpedo, a weapon that was only brought into practical use fifty years ago. The torpedo-boat was small, but in comparison with the speed of battleships of the time she was speedy. The earliest torpedoes were very unreliable and could only be used at short ranges, so the torpedo-boat had to make a rush at her prey, fire the torpedo and make off again.

This was a new menace in naval warfare. It found immediately a school of enthusiasts who vowed that the torpedo-boat was the sole arbiter of war at sea, that battleships were no longer any use, and that it was waste of money to build the mammoths. Precisely the same thing happened fifty years later when the submarine became a practical proposition. The submarine enthusiasts had forgotten the fate of the torpedo-boat.

The antidote to the torpedo-boat was soon evolved by naval constructors. The torpedo-boat-destroyer was designed, slightly larger and faster, and carrying small guns that would smash the frail shell of the torpedo-boat. The new craft was often wrongly called a "torpedo-destroyer," but it did not destroy the torpedo; it destroyed the torpedo-boat. It destroyed it so effectually, both in theory and in fact, that it made it out of date, and to-day the functions of both boat and destroyer are united in one craft which the British Navy calls a destroyer though the German Navy clings to the older term torpedo-boat. There is only one difference between the two. The latest British types carry heavier guns than the German.

The destroyer is absolutely unarmoured. Her shell consists solely of thin steel plates. It was generally believed before the battle of Jutland that a single shell from a big gun would blow a destroyer to atoms. Yet Sir David Beatty records that the destroyer *Onslow* while attacking German battle-cruisers "was struck amidships by a heavy shell," and thereafter "was able to struggle ahead again and made straight for the (battle-cruiser) *Derfflinger* to attack her."

If you can imagine a fly-weight boxer with half the wind knocked out of him making straight for Bombardier Wells to attack him you have some idea of the remarkable feat of the *Onslow*.

Speed is the real defence of the torpedo-boat-destroyer, though her offensive power in guns (which is the best defence of any man-of-war) has gradually increased from the single 12-pr. gun of 1894 to the three 4-inch (31-pr.) of 1914. Particulars of destroyers built since 1914 are still confidential, but it will give away nothing if we assume that our designers have neither gone backward nor stood still.

The oldest destroyers now in service were built for a speed of 27 knots, and their re-

ciprocating steam engines developed 3800 horse-power to do it. In 1914 naval architects publicly described 35-knot destroyers with geared turbine and super-heated steam machinery of 40,000 horse-power. It may seem that the increase in horse-power is unnecessarily large for the increase in speed, but it must be remembered that the destroyer of to-day is three times as heavy as the destroyer of twenty years ago, and that the greater weight requires much greater power in proportion to move it at even the same speed.

Why has the big destroyer become so big?

It has only followed the natural development of every class of warship. The small protected cruiser grew from the old *Pegasus* of 2135 tons to the historic *Powerful* of 14,200 tons, and thence into the first armoured cruisers, which grew and grew until they became the *Minotaur* of 14,600 tons, carrying four 9·2-inch and sixteen 6-inch guns, as compared with the eight 4-inch guns of the *Pegasus*. And these in turn developed into the battle-cruisers.

The first submarines displaced 104 tons. The latest building in 1914 displaced 1200 tons.

It is the same throughout the history of

naval architecture. Every design is improved on and enlarged until finally the type is altogether lost sight of, and then we go right back to the beginning again with some fresh kind of small ship.

The destroyer had to grow, however, not only because of general improvements in design, but because it became more and more evident that it would be required to work on the high seas, and not only in coastal waters and round harbours, as the first torpedo-boats and destroyers did. It had to become an ocean-going vessel. It had to be stronger to withstand heavy weather. It had to be able to carry larger quantities of coal and stores so that it could stay away from its base for longer periods, a quality which is generally described technically as "radius of action." And finally it had to be a more comfortable home for the men who were to fight the ship. The early torpedo-boats had a crew of only fifteen men. The ocean-going destroyer of to-day carries a crew of one hundred.

From the simple duties of a watchdog at the gates of a port, the destroyer developed into a close attendant on the great Battle Fleets wherever they might go.

Destroyers, however, have played a less noticeable part in the great war at sea than appeared probable some few years ago, when the historic feats of the Japanese destroyers off Port Arthur lent to that class of warship a romantic interest which did not survive the test of further practical experiment.

This is not to say that the destroyer has proved useless. Far from it. What has happened, however, is that the utility of the destroyer has been found to lie in directions different from those which were anticipated, more particularly by German naval tacticians. Reference has occasionally been made to the "break-through," which was to be a feature of the German naval tactics, but very few people outside naval circles know what it is. The name of the manœuvre indicates pretty clearly the aim. Destroyers attached to the battle fleet were, at a given moment, to break through the lines of their own battleships and make an onslaught on the enemy fleet. The operation was extensively practised in all the German naval manœuvres after the evolution of the idea had indicated the necessity for large destroyers of good sea-keeping capacity. These craft kept with the

bulk of the fleet, sheltering under the lee of the big ships in action, ready to break through and dash up to the enemy battleships to torpedo them at short range, if and when the German admiral decided that the fire of his opponent was slackening and his line beginning to waver.

The manœuvre was tried for the first time in actual warfare in the battle of Jutland. Both sides used it, but with inconsiderable success. The first instance was during the action between the battle-cruiser squadrons in the early stages of the engagement. Both sides simultaneously flung destroyer flotillas at the opposing heavy ships, with the result that the light craft met mid-way, fought each other, and although the German attack was driven off, the encounter broke up the formation of our flotillas; and their attack on the German battle-cruisers "was rendered less effective."

Sir John Jellicoe refers to the fact that "the German Fleet appeared to rely very much on torpedo attacks," but the total outcome of them was only the torpedoing of the *Marlborough*, which was able to remain in the line and a quarter of an hour afterwards

fired fourteen rapid salvoes at a German Dreadnought, and drove her out of the line.

The destroyer has developed special destructive functions in this war, as the officially announced losses of German submarines show. It was a destroyer, the *Badger*, which rammed a German submarine off the Belgian coast in November 1914. Destroyers accounted for U 8 off Dover on March 4, 1915, and the *Ariel* sank U 12 off the Firth of Forth on March 10, 1915. In one of the authorised accounts of the work done by the Grand Fleet, Mr. Frederick Palmer, the American correspondent, threw further light on this function of the destroyer. The Fleet was putting to sea, preceded by destroyers, and he asked the commander of the ship from which he was watching the passing of the ships :

"Are not German submarines waiting outside ?"

"No doubt. Two or three are always there," was the reply. "But the destroyers know how to keep them off."

This aspect of the functions of a destroyer it is not possible, as yet, accurately to estimate —nor if it were possible would it be permissible.

The trend of naval thought on the subject,

however, is very clearly shown by the importance attached to the programme of destroyers recommended in 1916 by the United States Navy Board. Many fantastic pseudo-programmes containing scores of submarines have been suggested, but the official programme includes six destroyers. These are to be 30-knot craft, of 1125 tons, carrying four 4-inch guns, and fitted with four triple-tube torpedo tubes. This design is a great advance on anything that the United States has hitherto built. The mounting of 4-inch guns is in accordance with the trend of design in other navies, but the craft are larger than those generally built elsewhere, and the decision to carry the guns amidships well above the water-line indicates the prospective use of the craft in heavy weather in the Atlantic. It will be remembered that the *Good Hope* and *Monmouth* were unable to use all their guns in the battle off Coronel because of the high seas that were running. The lesson of that incident has been borne in mind by the United States Navy Board.

The use of triple torpedo tubes is an interesting but questionable feature. Many navies

had not, a year ago, reached the stage of adopting the twin torpedo-tube. Every engagement in this war has shown the comparative unimportance of the torpedo when opposed to vessels carrying guns of more than 4-inch calibre. It is the gun and the ram that account for the destruction of submarines, and not the torpedo, which at best is a weapon of opportunity. The *Emden*, finding herself out-gunned by the *Sydney*, endeavoured to close to short range and torpedo, but failed. German destroyers attempted to close the range in the battle of the Dogger Bank, but the attack was strangled at the outset by the heavy fire poured on them from the *Lion* and the *Tiger*. The opportunity was lacking in each case.

CHAPTER VI

SUBMARINES

WHOLE books have been written about submarines. Many more and bigger books will be written. My task is to compress into a few pages an easily understandable synopsis of what the submarine is, and what it may be.

It is generally understood that what we call a submarine is a vessel that can navigate on the surface, and at need can close up all her hatches, and go under water, remaining there for varying periods of time up to about twenty-four hours, cruising at slow speed, and occasionally creeping up near to the surface in order to get a view of what is going on, by means of a series of looking-glasses at either end of a long thin tube, which is called a periscope.

The fighting power of a submarine is mainly concentrated in her torpedoes.

The tubes from which these are fired have

gradually increased in number from the one of the earliest types, to eight in the craft building in 1914. Each tube has one torpedo in it, and at least one in reserve, when the submarine leaves port on a cruise.

The great necessity in submarine construction now is to increase the speed, because without speed the submarine is very much at the mercy of fast surface craft like destroyers.

The reports about 5000-ton submarines, and the forecasts of imaginative people that the day of the submarine liner is at hand all come to grief on this question of motive power. The confined space in the engine-room of the submarine limits the stroke of the engine, and so makes it difficult to obtain the same horse-power as can be got in motor-driven surface ships. French marine engineers have recently turned to steam-driven turbines for underwater craft, the boilers, of course, being heated by oil, and the steam rapidly dispersing at need. To what extent they have been successful is not known, as the war broke out before any extensive trials had been completed.

Other engineering questions are concerned in this matter—pumps, ballast tanks, drainage,

and all sorts of auxiliary engines. Optics, too, have their part, for the periscope, which originally was a frail and leaky contrivance likely to cloud over after a very little while, has now become a monocular or binocular telescope enclosed in tubing which is very little affected by the weather.

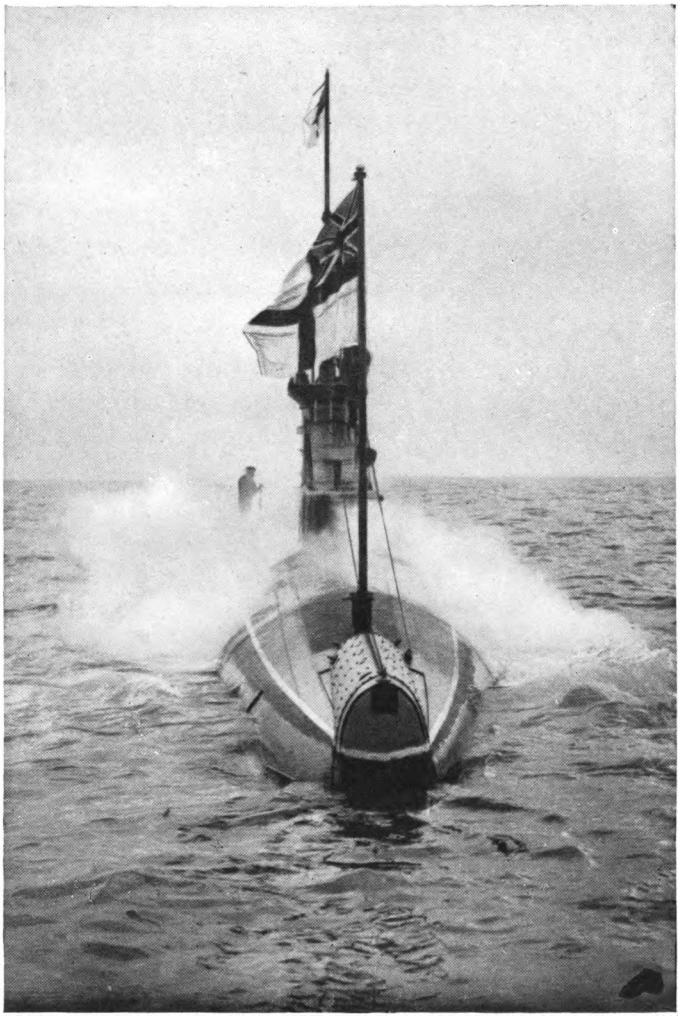
The earliest submarines were just shells into which engines had been fitted. There were no compartments. The latest type of underwater craft is as much sub-divided as an Atlantic liner. There are two living apartments for the crew, and one for the officers, both of which are some distance from the engine-room, so that the noise of the propulsion no longer deafens the crew. In addition to comfort, this sub-division makes for safety. Any explosion or fire, if not too fierce, can be confined to the one compartment, and the flooding of one compartment need not mean the sinking of the vessel.

The United States navy, which does more for the comfort of its men than any other, has introduced many reforms into its submarines. In place of the electric heaters, which used to absorb a lot of reserve current from the accumulators, steam heaters have

been fitted in the newest submarines, electric cooking stoves being retained. An urn keeps coffee constantly hot throughout a cruise, and, on the other hand, an ice safe is installed to carry fresh provisions sufficient for at least three days, so that the men shall not live on tinned food as well as tinned air all the time.

Fresh water was, of course, a great necessity, and the earliest types used to have water tanks, and there was dire punishment for any one who took an involuntary bath in them if the boat lurched. The rule was "as much as you want to drink and wash twice a day." That restriction, however, has been got over by the installation of a small distilling plant, which can supply practically all the water that any thirty thirsty, dirty men could want in twenty-four hours.

All these facts are indications, of course, that submarine craft for use in the merchant marine could be built. So long, however, as they have accommodation for only thirty people, and that the sole cargo space is that occupied in the war-submarine by torpedo-tubes and spare torpedoes, there does not appear to be any commercial incentive for their construction.



SUBMARINE E 8

Immensely technical though the subject is, it would be foolish for any one to shirk consideration of the problem which is most nearly to affect warship construction when we return to our peaceful vocations of preparing for war. Far and away more important than the question of "Dreadnought or submersible" will be the question of "Diesel or turbine," with quite possibly an unexpected shift of the wind into the quarter of electricity.

Certainly the naval architects of the day are by no means blind to the possibilities of the motor-engine for the very largest class of warship, and presumably no twentieth-century Board of Admiralty will be so muddle-headed as that of Lord Melville in the early nineteenth, which solemnly put on record its belief that the adoption of steam instead of sails "was calculated to strike a fatal blow at the supremacy of the Empire." There was one man of that age who had foresight, and that was Hardy—Nelson's Hardy— who said: "You will see great changes in naval architecture. Some people laugh at science, but science will alter the whole character of the Navy."

To-day we do not laugh at science.

The motor-battleship has been a dream for a great many years, but it is now more than a dream. At a recent meeting of the Institution of Naval Architects, it was deliberately asserted by a speaker that the thing was an engineering possibility. Not a voice was raised against the assertion. At the same time in France, the semi-official *Fleet Monitor* has been discussing the same question and enlarging on the advantages of the Diesel-engined battleship, and by a curious coincidence a French Admiralty official has published a book in which he advocates mildly the abolition of the Diesel for submarines and its replacement by steam! The situation is not without its comicalities.

M. Olivier Guihéneuc, in his *Dreadnought or Submersible?** gives particulars of a new steam generator for use in undersea craft which is certainly interesting. It is, if I may be thoroughly untechnical, a sort of haybox-cookery idea. The water-tube boiler is surrounded by material which accumulates and stores up heat. On the surface the vessel is driven by steam generated by fire, petrol gas flame furnaces being used, and when the

* Paris: Perrin et Cie.

submarine dives those flames are shut off, but the heat accumulated round the tubes continues indefinitely to generate more steam.

The thing sounds fantastic, but it is stated to be actually in practical use.

What is the reason for this change of face in regard to submarine propulsion?

It is again a matter of speed. So long as the submarine remains the slow craft that she is at present, so long as her submerged speed is round about eleven knots, she will remain a simple auxiliary to the surface squadrons with their 25 and 35 knot units. The French ideal is a submarine that can do 32 knots on the surface and 22 submerged. No one has as yet come anywhere near to a realisation of that ideal, and so long as the heavy-weight of a double installation of electric motors and Diesel motors, for submerged and surface propulsion respectively, continues to be carried, it is very doubtful that any such ideal can be obtained. Hence the search for the "unique" engine, some type which shall operate equally well on the surface and submerged.

As I said in regard to destroyers: if you increase the power of your engines you increase

the weight and so increase the size of your ship. Now the great utility of the submarine is her invisibility when submerged, but a very large ship under water, by reason of the displacement of water when she moves, is almost bound to betray her presence. Therefore every effort must be made by inventors to discover an extremely light-weight engine which will give high power, if the submarine is ever to approximate to the ideal. When they have discovered that they will be faced with the further problem of discovering a gun weighing about twenty-five tons which will be as destructive as the 15-inch gun which weighs about 100 tons. Then they will have to discover armour plates as effective as plates ten times their weight. Thereafter the era may begin when the submarine will have displaced the surface Dreadnought.

CHAPTER VII

DREADNOUGHT AND SUBMERSIBLE

THERE is only a very small school of thinkers in this country who consider the future of the submarine to be illimitable. There is a larger school in France, but, then, what is picturesquely termed "naval dust" has always been more favoured by French theorists than by British. It would lead me into too long a disquisition on strategy to demonstrate how this error is the lineal descendant of the mistaken belief of many old-time French admirals, that avoidance of action (or the passive defensive) was as commendable a thing as a victory, but it is nevertheless a fact.

The first admission by the submarine that it was inferior to the surface ship came when the underwater craft were armed with guns in addition to the torpedo tubes, which were the original armament. The first guns were one-pounders, but progress has been rapid,

and we hear to-day of submersible boats designed to carry 3-inch (12-pounder) guns.

That type of craft is no longer a submarine pure and simple. It has become a submersible gunboat. Now, man has invented many things. He has invented a torpedo tube that will fire torpedoes under water. But he has not yet invented a gun that will fire shells under water. Therefore the submersible, to use her guns, must work on the surface—in other words, must become a common or garden surface ship. Her only advantage over the ordinary gunboat or destroyer is that if she foresees attack in overwhelming force she can close up the gun and submerge. That is to say, her rôle is one of passive defence : she avoids action.

That passive defence was the cause of the general defeat at sea of the French in the eighteenth century—"they imagined they could make war without fighting," in the cutting phrase of a modern French naval writer, Admiral Daveluy.

Precisely the same fate awaits the passive defensive of any navy that commits itself solely to the submarine, or the submersible, as a weapon of war.

It will be said that the submersible boat can be made larger, can be more heavily armed, can be armoured. Up to a point that is true, but there comes a stage at which the advantage of submersion is lost by reason of size. There comes a stage, too, when the limits of engineering are reached—in our present development of knowledge—and then it becomes a question of whether it is better to build a slow electric-motor-driven ship that can submerge, or a fast steamship that cannot. There can be no doubt of what will be the answer of seamen and naval architects to that.

Why were submarines ever armed with guns? What advantage has the gun over the torpedo?

The first and greatest advantage is that of accuracy of aim. The shell from a gun is far more likely to hit a moving target than the torpedo from a tube.

The second advantage is speed. A shell from a 3-inch gun will reach a target a mile away in 2·38 seconds. The torpedo will take 79·2 seconds to cover the same distance. Also a 3-inch gun will have fired thirty-two shells, each of which will have reached the

target, by the time the one torpedo, fired at the same time as the first shell, arrives there.

The figures for the heavier guns, of course, are different, because the 13·5-inch gun naturally does not fire so rapidly as the 3-inch, nor is it likely to be used at so short a range as one mile. At a reasonable range for big guns to be in action six 13·5-inch shells would reach the target in the time it takes one torpedo to cover the distance. Multiply that six by ten, the number of guns that can be fired in a single broadside by one of the *Ajax* class battleships, and the fighting value of the big gun as compared with the torpedo surely requires no further demonstration.

If it does, consider the action of the surface ship that desires to drive off torpedo-craft attack. It does not hurl torpedo after torpedo at the attacking ships. It relies on the deadly accuracy and rapidity of fire of its small guns. There are few torpedo craft that can pass unscathed through a hail of 12-lb. shell, where scores would laugh at an attack on themselves by their own particular arm, the torpedo.

If the submarine gets its chance—and it has

neither had nor made a great many in this war—it may do an immensity of damage in a few minutes. So may the drifting mine. Armour will preserve a ship from a certain amount of gunfire damage, but armour is impracticable against the torpedo and the mine, because they strike below the water-line, and the defensive armouring of ship's hulls down to the keel would add so enormously to their weight that one or other of their offensive attributes—gun-power or speed—would have to be reduced in compensation. Armour, again, is in the nature of the passive defensive, and must only be used within limits.

Measures to counteract the mine have been taken during this war, but one is naturally prohibited from indicating their nature or their efficacy. The measures to be taken against the torpedo are still in the nature of hypotheses, and may be discussed in general terms. I am inclined to believe that M. Raymond Lestonnat, the French naval writer, is on the track of a very possible solution of the problem when he reminds us that, about twenty-five years ago, there was a cross-Channel steamer built with two separate

hulls connected above water by decks. She was called the *Calais-Douvres*, and was built in that special form not for safety, but to overcome the rolling which was so uncomfortable in the old-time Channel steamers. The big surface fighting ship of the future may possibly develop into a series of hulls joined by armoured decks above water, the idea being that, although one of the hulls might be damaged by underwater explosion, the stability of the whole ship would not be thereby destroyed.

This is, of course, but the germ of an idea, and one borrowed like many other modern devices from the very ancient world, for the native fighting ships of the Southern Pacific many centuries ago were composed of half a dozen canoes joined together by a wooden platform.

This war is providing the corps of naval constructors with any number of new problems. All sorts of variants of the old "gun *v.* armour" quarrels are cropping up. Some are problems that call urgently for solution, for they affect the design of the next class of battleships to be built. And, with all deference to Sir Percy Scott and the "naval

dust " school, battleships are more important than submarines.

Anti-submarine craft will evolve themselves out of the experience of the war. Indeed there are indications in the United States—the one big naval Power that is not actively concerned in operations—that one lesson in this direction has been well assimilated. Publication has been allowed in Great Britain of the information that the American Navy is adding to its forces a flotilla of fast motor-boats with a heavily armoured prow to act as " submarine destroyers." American naval men have apparently considerable belief in the efficiency of this type, which has been picturesquely called the " weasel of the sea."

The present design is a vessel about sixty feet in length, with a draught of two and a half feet. It will have high-powered engines, though really 35 knots is quite sufficient, since a submarine on the surface is not capable of much more than 22 knots at the most at present. The " weasel," moreover, has several motors, so that a breakdown in one need not rob her of the chance of catching her prey. She is as handy as a bicycle, and will turn in little more than her own length,

so that the skill of any torpedo gunner in a submarine has to be amazingly good to get a hit, and so far as gunfire is concerned the men in charge are sheltered behind an armoured hood quite strong enough to keep out the small shells at present fired from the guns fixed in submarines. Mine-fields have no terrors for the "weasels," for they skim practically over the surface of the water.

The confidence of the American naval authorities in this class of anti-submarine vessel is such that they have organised a volunteer patrol of motor boats on the Atlantic coast, classifying the different boats according to their speed.

The idea is spreading. Plans have been submitted to the United States Navy Board for "motor light cruisers" ninety feet long with a speed of 30 knots, carrying two 3-pr. guns and an above-water torpedo-tube amidship. These craft would be more seaworthy than the "weasels," and the idea is one that may possibly develop. Anti-submarine devices are at present too nebulous to be described. We have all heard of huge nets in all sorts of wonderful places, of "harpoon torpedoes," of aeroplane bombs and, of course, destroyer

rams. No useful purpose is served by speculating on these matters. But it is worth while noting that all the offensive measures taken, so far as is known, are based in the assumption that the submarine is and will remain a small ship.

It was Mr. Kipling, I think, who once said: "The Navy is very old and very wise."

CHAPTER VIII

GUNS AND SHELLS

OFFICIAL tables of British Naval Ordnance catalogue twenty-seven different kinds of gun for use in men-of-war. Messrs. Armstrong Whitworth's catalogue totals thirty-five. These range from the little 1-pr., that, all told, weighs less than 4 cwt., up to the 15-inch, that weighs about 100 tons.

It is not possible here to describe every one of these. The beginner must be satisfied to study general principles, and to understand the system on which a ship's artillery is distributed.

The main battery of any big ship is naturally composed of her biggest guns.

These were 12-inch guns until a very few years ago. Since then we have progressed to the 13·5-inch and 15-inch pieces. A ship armed with these does not carry 12-inch guns also as a secondary battery. This, in

the latest ships, is made up of 6-inch guns. In those a little older it is 4-inch. The secondary battery is carried solely to beat off attack by small craft such as torpedo-boat-destroyers, against which rapidity of fire is more important than heaviness of shell.

The following list of rounds fired per minute and of weight of shells is compiled from tables published before the war by various armament makers :

Gun.	Weight of shell. lbs.	Rounds per min.
3-pr.	3	30
3-inch	12	25
4-inch	31	15
6-inch	100	10
9·2-inch	380	4
12-inch	850	2
13·5-inch	1400	2
15-inch	1900	1·2

That little table, I think, conveys with remarkable emphasis the enormously rapid growth of the gun in power as the calibre (or inch measurement) increases. Thus the 3-inch shell weighs 12 lbs. ; double the calibre is the 6-inch with a shell of 100 lbs., about eight times as much. In the same way the 12-inch shell is 850 lbs., 8½ times as heavy as the 6-inch.

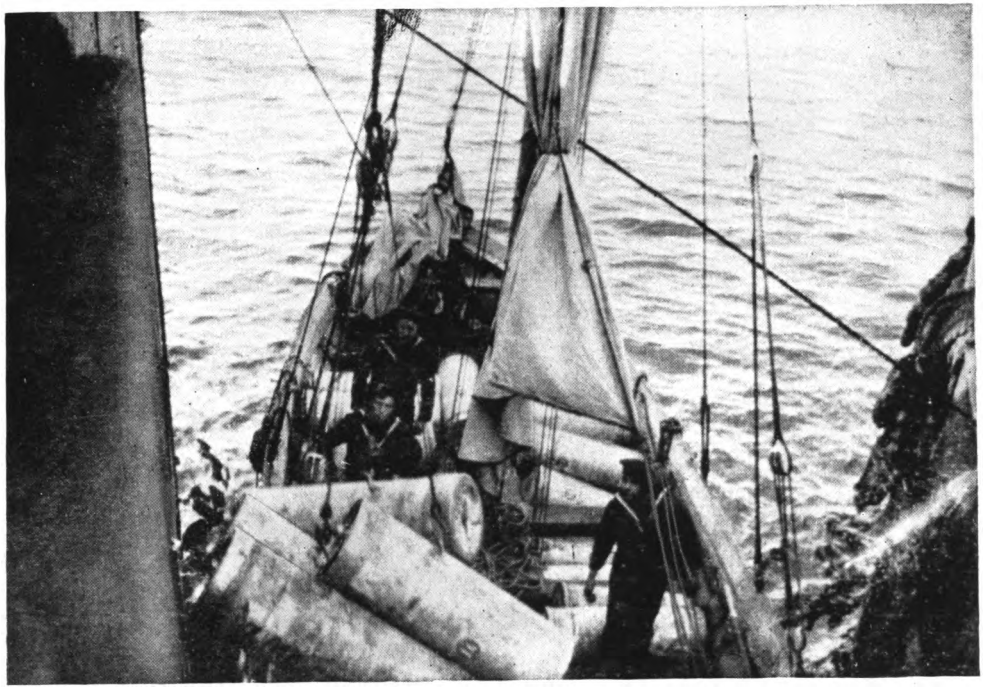
The rapidity of fire does not do much to balance matters.

The ten rounds a minute of the 6-inch gun total up to 1000 lbs., which is considerably less than the 1700 lbs. of the two rounds from a 12-inch gun, while the 300 lbs. that is the total for twenty-five rounds of the 3-inch falls equally far below the 1000 lbs. of the 6-inch. But five 6-inch shells hitting a torpedo-boat-destroyer in different places in half a minute are more likely to smash her up than the one 850-lb. shell of the 12-inch gun, as we have seen.*

In all these comparisons, however, it is well to bear in mind the one factor that we cannot express in figures, that is the value of the man behind the gun. We talk sometimes of one gun out-ranging another, and though mathematically it may be correct, the real range of any gun is the distance at which the man behind it can make its projectile hit the target. The 13·5-inch gun in the hands of men who cannot shoot would not defeat the 8·2-inch gun in the hands of a crack gunner.

The designing of a gun is the work of

* See *ante*, p. 61.



TRANSHIPPING CORDITE CARTRIDGES FOR BIG GUNS

scientists far more than of seamen. The naval gunner says to the scientist, "I want a gun that will perforate so much armour at such a range."

It is for the scientist to provide a powder that will propel the shell out of the long tube that we call the gun, with such force that it will travel the necessary distance and arrive at its target with still sufficient force to penetrate the armour. Then he has to discover a combination of metal that will not only not crack when it hits the armour, but will go through the armour without allowing any damage to the very delicate mechanism that controls the explosive inside the shell. Once the armour has been pierced then the explosive can go off—inside the enemy ship.

Needless to say all these problems have been solved, though every year there are improvements on the methods employed.

Then there is the question of the resistance of the gun itself, alike to the shock of the explosion of the cordite that propels the shell out of the gun, the eroding action of the heated gases on the metal, and also to the wearing away of the inside of the tube

by the passage of the rapidly rotating shell. When it is realised that the weight of the charge of cordite in a 12-inch gun alone is 285 lbs., and that the explosion of this is sufficient to send the shell of 850 lbs. out of the muzzle of the gun at a speed of 3000 feet per second, or roughly thirty-four miles a minute, it is evident that the strain on the gun is tremendous.

There are two methods of counteracting this strain. One is the German method of making the gun in sections or hoops which are ultimately welded together. The other is the British way, the wire wound system, in which the inner lining of the gun is composed of specially strong wire wound round and round. A battleship carrying eight big guns will have 1000 miles of wire in its guns. There is one great advantage in this system —the inner lining can be taken out when it becomes worn after firing a certain number of shells and replaced.

The big guns in a battleship are housed in turrets or gun-houses that move round on a fixed point, so that the guns can fire over either side of the ship as is required. The concentrated fire of all the available guns on

any one side of the ship at once is called a broadside.

The motive power that moves these great revolving forts is hydraulic; electricity was tried but was found too delicate to withstand the shocks and shattering of action. All the movements of the guns inside the turrets are performed by hydraulic pressure, too, controlled by little wheels.

Right down below the turrets in the bowels of the ship are the magazines. Shells are stored in one place, the cordite cartridges in another. The shells are hardly ever touched by hand, even in the case of the smaller calibres. They roll gently from the shell bay into little cradles running on rails, which carry them to the bottom of the ammunition hoist, a heavily armoured lift-shaft which runs straight up into the turret. The shell rolls again gently and without the slightest shock from one cradle to another, and so by hydraulic power up to the breech of the gun, where it is again transferred to the loading cage, another form of cradle, and finally passes at the right moment into the gun itself.

These operations must all be carried out

with the precision of clockwork. When it is remembered that a 13·5-inch gun can fire two 1250-lb. shells a minute, and that, in addition to the shells, the prescribed number of cordite cartridges, which propel the shells from the gun, must go up the ammunition hoist at the same time, it is small wonder that the half-clothed men at work in the magazine are in a bath of perspiration practically all the time the ship is in action.

It is this ammunition hoist which may be a source of peril to the ship. Of course all sorts of safety devices are in use to prevent anything like flames or heavy concussion affecting the shells in the cradles on their way up to the shaft. At the same time, if the roof of a turret were to be blown off, the shock to the whole delicate mechanism would be such that safety devices might cease to work. One shell, perhaps just on the point of being loaded into the gun, would go off. Another, affected by the shock on its way up, also goes off. The air, tinged with cordite fumes, in which the men cough with a curious irritable sound, is instantly full of flames, beaten downwards by the sudden opening of the top of the turret to the draught

created by the ship moving at perhaps twenty-eight or thirty miles an hour.

Need the rest be described ? One magazine and then another blows up, and the ship is gone. A minute later the vessel that had been her next astern cuts right through the water beneath which the wreck is sinking and the Navy is a thousand good lives the poorer.

That does not inevitably happen in every ship. Information as to the safety devices employed, is, of course, confidential, but some work better than others, and in some cases the turret can be injured without putting the whole of its internal working out of gear.

Shortly after one of the big engagements at sea during the present war there came into my hands a letter from an old school friend who had volunteered for service in the Navy at the outbreak of war as a lower-deck man. He wrote :

" My station was in the magazine of the forward 13·5 turret, and to reach this it was not necessary to go on the upper deck, so we had not the slightest idea what force was opposed to us—for something seemed to tell

us that it really was action this time. However, when the hands were all down and the heavy armoured door was closed down on us, we knew that it was all or nothing as far as we were concerned.

"Hardly a sound could be heard as the ship steamed forward to the attack. Suddenly, bang! went the right gun of our turret, and everything, including the deck on which we stood, quivered, while the concussion coming down the trunk sent a rush of air through the magazine. Bang! went the left gun almost simultaneously, and the ball had opened. Henceforward it was one continual crash and clatter, and through it all the hiss of the hydraulic pressure and the hollow-sounding voices shouting orders down the voice pipes were most weird.

"In spite of the fact that we had stripped off, we were soon perspiring freely, such was the rapidity of fire. From time to time the men in the gun house shouted down such scraps of information as 'First ship afire and sinking!' 'Last two shots carried away two funnels and bridge of second ship!' etc., but apart from this we knew about as much of how things were going up top as you did

sitting in your private office. Whether we had been hit ourselves no one could tell. That explosion, followed by a quivering of the ship, might have been a salvo from our after guns, or it might have been a hit. We could feel that the ship was still on even keel, and that was all."

What is the limit to the size of a big gun ?

Among laymen there has been a good deal of discussion of the reputed 17-inch gun of the Germans, but very few people realise that there is little practical advantage in building naval guns beyond a certain size. Range in a fight at sea is not solely determined by how far the gun can throw its shell effectively. Gunners on land fire at fixed and immovable points and can work their range-finding by mathematics, without ever seeing what they are firing at. Gunners at sea, however, have a moving target to hit, and they must see something of it, even though that something be no longer than the point of a pencil.

The man who looks for the target is called a "spotter," and his post is up in a little armoured cabin, that looks at a distance like

a pill box, on the mast. He is about 125 feet above the water-line and at this height the visible horizon is 25,800 yards away.

That is the practicable limit of range for big-gun firing. The British 15-inch gun can fire a good deal further than that. The effectiveness of the shell at that distance is confidential information, but we know that the United States 14-inch shell will theoretically penetrate 10·6 inches of armour at 25,000 yards.

That is, of course, the outside range. We have found in practice in this war that 18,500 yards is about the limit for really effective aiming. At that distance the American shell will penetrate 12·2 inches of armour, so that it is reasonable to assume that the British 15-inch is at least as good. It will penetrate any armour that is likely to oppose its passage. That is to say, it is quite effective.

A larger gun could not do more, and at the same time if you mount a larger gun you mount a heavier gun, which means that either you have less guns or you have less engines, or you have less armour. The additional

weight must be saved somewhere, unless you are going to build 60,000-ton ships, a proposal which no naval architect has yet taken seriously so far as I know.

American experts have worked it out that a battery of twelve 14-inch guns compared to a battery of eight 16-inch guns would be effective as 1·16 is to 1. We have no data to compare the eight 15-inch guns of the *Queen Elizabeth* with the six 17-inch of some imaginary German ship, but it is fair to presume that the result would be approximately similar.

Every gun has its individual whims. Certain inaccuracies are inherent in the flight of all projectiles and in the aim of all guns. A fractional error in the weight of a shell or in the powder charge may make a difference to the way the shell will travel. The centre of gravity of the shell may not lie exactly in its axis of rotation, or the inner tube of the gun may be slightly worn. The discovery and manipulation of these errors is called "calibration."

The guns of a man-of-war are not fired haphazard by the gunner whenever he thinks he has aimed his gun correctly.

There is such a thing as fire control and fire direction.

Much of it is confidential, but the general principle is quite clear. Certain officers are employed in spotting the fall of the shells, the position, course, apparent speed and other details concerning the target. These particulars are all collated rapidly by certain officers in the fire control station and they deduce from them the necessary details for aiming each gun in each target. Orders are then telephoned through to the gun-layers in the turrets, and they report when they have carried out the necessary movements to bring the target into its proper bearing in their telescopic sights. When all the guns bear, the order to fire is given from the control station, and the salvo or broadside crashes out. It is for the "spotters" to report just where each shell falls, whether short of or over the target, ahead or astern Then the officers in the control station correct their calculations.

All sorts of mechanical devices exist to assist the work, and the speed at which the calculation must be worked out is obvious when the fact is borne in mind that a big

gun can be reloaded and ready to fire again in about twenty-five seconds after the first shell has left the muzzle. Details, however, are not known outside the inner circles of the service, where the subject of gunnery is the special life study of the men in control.

CHAPTER IX

TORPEDOES

"ANY maritime nation failing to provide itself with submarine locomotive torpedoes, would be neglecting a great source of power both for offence and defence."

On the strength of this recommendation by a technical committee, the British Government in 1871 paid Mr. Whitehead of Fiume the sum of £15,000 for the secret and right of manufacture of his torpedo 14 feet in length, 16 inches in diameter and carrying a charge of 67 lbs. of gun-cotton.

It was able to travel 600 yards at 7·5 knots, but its course was decidedly erratic. The British topedo of to-day is 17 feet in length, 21 inches in diameter, and carries a 330-lb. charge of an explosive which is an improvement on gun-cotton and is familiarly known to Navy men as "T.N.T.," and it holds its

course, in a very high percentage of cases, with absolute accuracy.

It is sometimes forgotten by the uninitiated that the torpedo is a projectile that is fired through the water and not through the air. Moreover, it is nearly always fired from a tube that is itself below the water-line of the ship and not, as it used to be in the early torpedo-boats, from a tube on the deck. Some people imagine that the submarine must come entirely to the surface to fire a torpedo, but that is not so; provided she has seen her prey by means of the periscope and has taken her bearings to aim, she has no need to show herself at all when she fires.

In travelling through the water the torpedo is naturally liable to be deflected from its course. Many of the older naval officers of to-day can tell delightfully funny stories of the early experiments with the "tin fish," as it was promptly dubbed and even the modern torpedo-lieutenant knows it for a treacherous and ungrateful animal. To take only one small point—the speed of the torpedo may be considerably affected by a change of a few degrees in the temperature of the water.

The torpedo consists of eight sections,

which from head to tail may be briefly described thus:

(1) The pistol and detonator.
(2) The explosive charge.
(3) Air-chamber containing the compressed air motive power.
(4) Balance-chamber in which are the controls of the rudders.
(5) Engines.
(6) Buoyancy-chamber.
(7) Rudders.
(8) Propellers.

The "pistol" is a small steel rod which is driven in against the detonator when the torpedo comes into contact with a ship's side. In the latest torpedoes it is believed that this detonator consists primarily of lead azide, which is absolutely insensitive to damp and has other advantages over tetryl, which was used at first to give greater force to the fulminate of mercury cap that actually detonates the charge.

The explosive charge, which was formerly tri-nitro-cellulose (or gun-cotton), is now tri-nitro-toluene, the T.N.T. referred to above. This explosive is a rival to picric acid (of

which lyddite is a form), and is derived from nitric acid and toluene, which is one of the benzine series. It is remarkably insensitive to shock or friction, and can be sawn through or fired on at short ranges by rifle bullets and will not detonate. But when it has been set off by a powerful detonator the force of its explosion is far greater than that of gun-cotton.

In the air-chamber of the torpedo is the supply of compressed air which works the propelling engines and the motor that controls the diving rudders.

The balance-chamber contains what is practically the steering-wheel of the torpedo, but it acts, of course, automatically under the guidance of a gyroscope controlling the rudders that maintain the torpedo on a straight course.

The buoyancy-chamber gives the necessary floatability to the torpedo.

This is, of course, the barest outline of the principle on which a torpedo is constructed. Improvements in the design of these projectiles are most jealously guarded by the Admiralties of the various Powers, and Germany long ago abandoned the practice

of buying hers from any armament works, preferring to make them in her own Government works, close to a suitable expanse of water where they could be tested in absolute secrecy.

The firing of the torpedo from its tube is done either by compressed air, or by an impulse charge of a few ounces of powder, usually cordite. Since the torpedo propels itself through the water it does not need a high initial velocity as does a shell from a gun. The engines of the torpedo's propellers are started by a trigger which projects a little beyond the casing of the torpedo, and touches a catch in the tube just before the torpedo leaves the tube. This opens the starting valve.

Loading the torpedo into the tube ready for firing is done by hydraulic power in large ships and by electric power in the submarine. The torpedo itself weighs 28 cwt., and the early system of pulley blocks for hoisting by hand had to be abandoned as too slow. Brakes are provided on the hydraulic runners which move the torpedo about, so that if the vessel is rolling in a seaway the load cannot get out of control as it is being passed along to the tube.

Aiming a torpedo-tube underwater in the sense that aiming a gun is done is unknown. The submerged torpedo-tube is fixed in the hull of the vessel, whether it be a battleship or a submarine, and it is only when the ship is laid on a course that brings the torpedo-tube exactly opposite the target that the torpedo can be fired.

It has been said that the torpedo is not a wholly reliable projectile ; and it is an axiom of war that the highest success is to be achieved only by the weapon that has the longest reach, can deliver its blow with the greatest rapidity and, above all, that is capable of being employed with the most exact precision. Now a submarine or a destroyer in a rolling sea is not a particularly steady gun platform, and it is a matter of great nicety for the torpedo tube's crew to judge just that fraction of a second when the ship is steady to discharge the torpedo. If it is fired when the ship is rolling, it will be deflected from its course and wasted.

The torpedo attains its maximum speed almost at the outset of its run. All the motive power is gradually exhausted, and unless it sank to the bottom it would become

just a drifting mine, but slightly less dangerous than a mine because it has only one sensitive point, the pistol, instead of some half-dozen as the mine has.

By the rules of warfare, however, every torpedo should be fitted with a contrivance that will cause the torpedo to sink to the bottom harmlessly at the end of a fruitless run. The number of German torpedoes found floating about the sea during the war shows that this device is usually forgotten in the torpedoes used by the Kaiser's ships.

CHAPTER X

AUXILIARIES

SOMETIMES in the papers you read of a ship that is described as an "armed cruiser." There is no such thing actually known to naval men, because all cruisers, being men-of-war, are necessarily armed. What is really meant, is an armed liner, or an auxiliary-cruiser, though occasionally the mistake is occasioned by the passion of Press telegraphists for abbreviation, which results in the unfortunate and harassed sub-editor receiving the mystic letters "armd crsr," which he deciphers as "armed cruiser" when it should be "armoured cruiser," a very different thing.

The auxiliary-cruisers have done extremely good work in the war. Upon them has fallen the bulk of the work of blockade in the North Atlantic, and many of them have

been engaged in pretty little scraps with enemy ships.

It was the auxiliary-cruiser *Carmania* that sank the *Cap Trafalgar*. It was the auxiliary-cruiser *Alcantara* that ended the career of the German commerce raider *Greif*, and was sunk herself in the action. For the first time in the history of the Navy, a merchantman flew the flag of a British admiral when Rear-Admiral Sir Dudley de Chair, who was in command of the blockading squadrons, transferred from the old cruiser *Crescent* to the liner *Alsatian*, and commissioned her as an auxiliary-cruiser.

Some day it will be possible to tell the full story of the doings of those merchant venturers of the sea, of the work they did, the perils they ran, and misadventures that befell them. We know of the sad fate of some—the *Viknor* and the *Bayano*, for example, that were lost with all hands by under-water explosion. We have heard the German version, which is not true, of the adventure of the *Baralong* with a German submarine.

But these auxiliaries have done many other things, heroic and tragic and comic, and the general public that has so long been

in the dark about the doings of the Navy will receive a thrill when finally the veil is lifted.

During the war the only thing known about most of them was the mere fact that they were serving in the Navy.

At the end of the carefully censored Navy List issued to the public in war-time, there was the only record of "H.M. ships" published. It began with H.M.S. *Abelard*, and ended with H.M.S. *Zylpha*, and among the intervening 2500 ships there are some of the quaintest men-of-war names in all our annals. I have always thought H.M.S. *Fubbs* in the days of Charles II one of the oddest Navy names I ever met, but this record-breaking war has displaced even the dear old *Fubbs* from that place of honour. H.M.S. *Q.E.F.*, H.M.S. *What Next*, and H.M.S. *Kipper* beat it.

These "warships," of course, are of all classes, from the liners converted into patrol-cruisers, down to motor-boats, and though no clue was given in the list to the character of any particular vessel, I suspect that most of the incongruous names belong to those blunt-nosed trawlers that go mine-sweep-

ing in order that the lordly battleships may proceed unscathed on their lawful occasions.

Kipling has written the anthem of the sweepers, "*Unity, Claribel, Assyrian, Stormcock,* and *Golden Gain,*" though since he wrote it three of them have disappeared from the list of H.M. ships. But who will write the epic of:

Lloyd George, Lord Haldane, and *Familiar Friend,*
Young Archie, Morococala, and *Zena Dare,*
Joseph and Sarah Miles and *E. A. B.,*
Boy Scout, By George, and *Grenadier?*

It would be personally gratifying to believe that H.M.S. *Ferriby* is a great merchantman, but I suspect that her peace-time cargoes have been principally fish landed at Hull.

H.M.S. *Editor,* too, ought surely to be a flagship at the very least, with a blue pencil rampant for her crest, and only Mr. George Graves could do real justice to the ideas conjured up by H.M.S. *Happy Days.* It must often have seemed a silly misnomer to her crew during the war-time winters in the North Sea.

Many a name of the olden Navy, of the

Navy of Drake and of Rodney, of Blake and of Nelson, figured in this list of the auxiliaries.

Victory, Mary, Rose, Hope, Swallow, Rainbow, Fancy—all these fought the Armada, and namesakes were parts of the sure shield in the twentieth-century war, humble parts, perhaps, but with their names none the less in the list of H.M. ships.

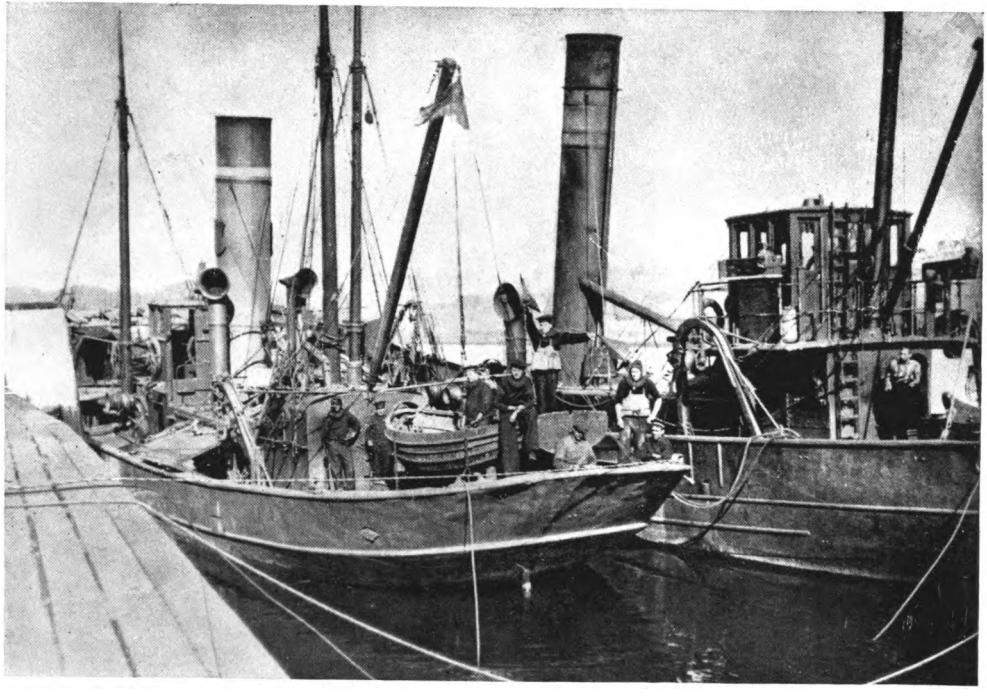
There was a *Half-Moon*, too, a name that had not figured in our fighting fleet since the battles of Barfleur and La Hogue in 1692; the *Hawthorn* repeated a name last recorded in 1546, and the *Hector* carried on a tradition that began with an armed merchantman on Lancaster's voyage to the East Indies in 1599, and has thirteen battle honours on its scroll, records of fights under men like Rodney, Cornwallis, Gardner, and Keith. Then there was also *Hero*, that helped to bang Mounseer Conflans at Quiberon, that fought de Suffren five times, and battled on the outskirts of Trafalgar.

These are all names that our regular men-of-war should bear, but, at least, it is good that they were on the roll in any way at all in this war.

The fact that the patrol-ship *Bluebell* was mentioned during the trial of Roger Casement would not give the enemy much information, for there were four ships of that name, distinguished as *Bluebell II, III* and *IV* from the original. This happened in the case of a good many namesakes of flowers among the new fleet auxiliaries, including the *Blossom, Bramble, Camellia, Campanula, Daffodil, Dahlia, Daisy, Honeysuckle, Hyacinth, Laburnum, Lobelia, Magnolia, Narcissus, Pansy, Petunia, Primrose, Snowdrop, Speedwell, Violet,* and *Wistaria.* The flowers that bloom in the Navy are plentiful.

Shakespearian names continually cropped up—*Portia, Bassanio, Belmont,* and *Jessica; Iago* and *Othello; Falstaff; Hamlet; Juliet* (without a Romeo); *Macbeth* and *Macduff; Hero* and *Beatrice; Oberon, Helena,* and *Hermia; Perdita* (and again no Florizel); and finally *Viola* with an *Orsino.*

Some stage enthusiast probably was responsible for H.M.S. *Pavlova,* which we will hope for the sake of her name was some nimble craft apt to dance upon the waters and not plod through them ploughboy-like. Art was



TRAWLER MINESWEEPERS IN PORT

represented by *Michael Angelo*, professordom by *Huxley*, music by *Elgar*, and fiction by *Anthony Hope*.

But surely it is the irony of fate that in the war with Germany there should have been a British ship flying the White Ensign that rejoiced in the name of H.M.S. *Prosit*. Was there a S.M.S. *Cheero* at Kiel or Wilhelmshaven?

These craft, however, were not the only auxiliaries.

It is sometimes said that we extemporised more than half the Navy with which we waged the war. Like many other facile phrases, it is only a half-truth. It is not even wholly true of those naval handmaids, the fleet auxiliaries, non-combatants every one of them, but essential units of a modern navy, in which every ship is a box of machinery. All the latent cussedness of the inanimate metals which man has shaped to serve his ends is leagued against the peace of mind of the engine-room men, the blacksmith's crew, the torpedo staff, and the half-score of diversified groups whose business it is to see that the wheels go round efficiently.

In that quaint verse, "The Laws of the Navy," it is written:

> "When the ship that is tired returneth,
> With the signs of the sea showing plain,
> Men place her in dock for a season, and her
> Speed she reneweth again."

That was written in the days before the inventive genius of modern naval constructors evolved the floating workshop and the mother ship. In these days the signs of the sea must be very plain before the ship that is tired goes into dockyard hands.

The *Cyclops* (the name, it will be remembered, of the giants who figure in heathen mythology as workmen in the smithy of Vulcan) was acquired by the Navy some seven years ago. She employs three hundred dockyard hands in addition to the crew necessary for navigation, and is equipped throughout like a small dockyard. She has an armourer's room, heavy and light machine shops, and a boiler shop in which plates can be bent and angle-iron sections rolled. In these shops there are overhead trollyways for transporting weights. Then, too, there are a smithy and a foundry, in the latter of

which is a cupola for iron capable of running one ton of molten metal at a charging.

All this, be it remembered, is in a sea-going ship of 11,000 tons and fourteen knots speed, which can be in attendance on the fleet in all weathers.

Another interesting side of the *Cyclops* is her distilling room. There are twelve distillers capable of turning out 300 tons of fresh water a day for the warships. The *Aquarius* is also a distilling ship, the *Assistance* is another repair ship, and in 1913 the steamer *Knight Commander* was purchased, renamed the *Reliance* and converted into a naval repair ship. She was due for delivery from the builders after the war began.

The United States navy has recently acquired a floating repair ship with the poetic and inappropriate name of *Vestal*. She is, in a way, an advance on the *Cyclops*, because she has a storekeeper's department with 1900 steel bins for holding assorted sheets, pipes, rods, timber and other "spare parts" for a fleet. She is also equipped with a three-ton electric crane in the machine shop.

Another type of auxiliary to the modern fleet is the seaplane-carrying ship, a sort of

nautical aerodrome that wanders over the seas with the main squadron, or carries aircraft to the nearest possible point to the enemy's coast-line and then launches them on their mission of destruction against points of military importance.

The *Ark Royal* was specially built for the purpose, but another seaplane carrier often mentioned in official despatches was the ex-cross-channel steamer *Engadine*, which was adapted for the work after war began.

The advent of the submarine also brought about the introduction of new types of floating dockyard. These vessels, about twenty in number, are mostly converted cruisers that act as parent ships and mobile bases for the flotillas, as well as being repair ships. They carry stores of oil fuel, spare torpedoes, and plant for charging accumulators, in addition to a full repairing outfit. Some ships, such as the *Maidstone* and the *Adamant*, however, were specially built for work as submarine "mother ships," and recently the Navy has indulged in the luxury of a submarine salvage ship. In the early days of underwater navigation, our seamen learned their business without any such aid in case of disaster. It

is characteristic of the German Navy that von Tirpitz built a salvage ship at the same time as his first submarine.

In this respect again the United States Navy has profited by European experience. The submarine tender *Bushnell*, which is their latest addition, is not only a dockyard, a workshop, and a storehouse, but is also a "home from home" for the submarine personnel. She was designed to give comfortable living accommodation for the crews of the underwater craft when they are not actually cruising, and is fitted with gear that enables her to tow five submarines simultaneously in order to economise fuel. Another interesting feature is the provision of gear both at the bow and stern for handling damaged submarines. The gear in the afterpart of the *Bushnell* is adapted to raise the stern of a submarine out of the water so that any necessary repairs to her screws or fittings may be carried out at sea. And finally, this nautical *multum in parvo* has special sick-bay accommodation for submarine men who are injured or ill.

It would be impossible to give in a short chapter even an outline of the myriad

varieties of repairs that are carried out in these peripatetic workshops. The complexity of the mechanism of a modern war fleet is scarcely realised ashore. The ships of the Grand Fleet that strangled Napoleon were simplicity itself by comparison, and it is safe to say that, even with repair ships, it is doubtful if any modern admiral could maintain his fleet intact off an enemy coast with nothing but an open roadstead as base for twenty-two months as Nelson kept his fleet off Toulon. Repair ships have, however, added enormously to the mobility of Sir John Jellicoe's squadrons, and the record of the engineering feats performed in this war should be wonderfully fascinating reading if it is ever available for publication.

We have already had one or two striking glimpses into the efficiency of the engine-room complements, as, for instance, in the case of the *Kent*, which was able in the battle of the Falklands to maintain a speed of twenty-five knots, though she was only built to do twenty-three, and did it, moreover, not when she was fresh from dockyard hands, but after months of hard hammering about the open sea in chase of elusive corsairs. Scores of

similar instances are known in the service; they also fight who only keep up steam. The record of the men who thrash about the sea in the rolling workshops of the *Cyclops* is worth remembering. They are as much entitled to our gratitude as the seaman gunner and the torpedo-lieutenant.

CHAPTER XI

MINE-LAYERS AND MINE-SWEEPERS

NEXT time you see a lump of coal look at it a second time. That lump of coal and a few more like it are the things that blow up battleships and liners, trawlers and destroyers. Coal is the direct ancestor of the high explosive. Any scientist will draw you up the genealogical table. Roughly the following generations will be found in it :

Coal.

Coal tar.

Toluol, benzol, phenol.

Thence, by intermarriage with the acids nitric and picric, come the younger generation, Tri-nitro-toluene, whose pet name is T.N.T., Ammonal, and a newly discovered high explosive whose name to the outside public for the present is " X."

These are just a few of the cousins who all spring from old grandfather Coal, and the

one who interests us most at the moment is T.N.T., because he is the gentleman who makes the mines go off.

A mine is a stationary or at most a drifting torpedo, without any motive power. It is an interesting fact that the French describe both things by the same word "torpille," and this fact has occasionally given rise to mistakes in translation by people who are not well acquainted with naval technical terms in the different languages.

The underwater mine as now used was the invention simultaneously of a British naval officer, Lieutenant Ottley, R.N. (now Rear-Admiral Sir Charles Ottley), and an Austrian. Its first use was as an automatic explosive submerged defence for harbour mouths. In that respect it was a perfectly legitimate weapon of warfare. Unfortunately it was not possible to keep it to that use.

A mine is an extremely complex thing to describe, but I will make the details as simple as possible.

The body is a metal globe which forms the buoyancy-chamber, and in the top of the globe there is the explosive, 290 lbs. of it in a large-sized mine, 200 lbs. in one of the

smaller ones. Out of the globe there stick four or six little horns, and one of these if touched will affect the detonator and cause the mine to explode.

That is the effective part of the mechanism. There is also, however, the anchoring gear. Before the mine is put into the sea the globe squats, as one might say, between four metal uprights upon a round flat weight, to which it is attached by a short length of wire rope, the greater part of which is coiled round a drum inside the weight.

When the mine is put into the water the whole contrivance sinks at once to the bottom. As soon as it touches ground the bump releases a little catch which sets all sorts of wheels revolving, with the result that the four uprights fall outwards from the globe and stretch themselves out flat like the tentacles of an octopus, gripping into the sea bed with the ends that were previously uppermost and so anchoring the contrivance.

At the same time the buoyant globe is released and begins to rise towards the surface, unwinding the wire rope from the drum inside the weight as it goes, until a fixed length has been unwound. Then the drum

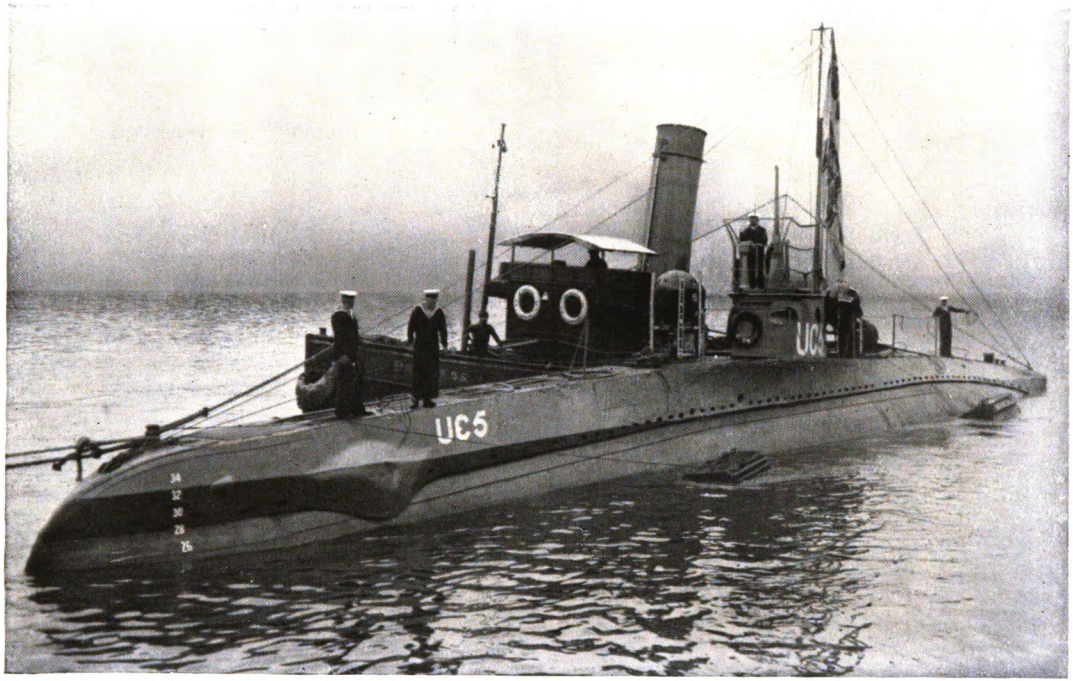
sticks so that the mine stops rising. It is anchored, a few feet below the surface of the water, invisible to any ship coming along, but high enough up to be touched by the keel or some underwater part of the hull.

There is another kind of mine, the floating variety, which is as nearly intelligent as an inanimate object can be. It has no anchoring gear, and has the capacity of moving up and down to varying depths in the water. When it is put afloat it stands upright with the explosive in its head and at its foot a small propeller. It is not altogether buoyant and begins to sink very slowly. At a certain depth, which can be regulated before it is floated, the propeller begins automatically to revolve and pushes the mine up to the surface again. Then the propeller stops, and the mine begins to sink again. This goes on for a prearranged time, which is regulated, of course, automatically, and at the end of that time a valve opens to let water rush into the mine and it sinks for ever to the bottom. One way in which this mine can be used with very deadly effect is to set it afloat in a current flowing towards ships that cannot be reached by guns and let it be carried

among them. This happened at the Dardanelles, where several Allied ships were blown up by mines that floated down on the current.

The sowing of a field of anchored mines is carried out by ships called mine-layers. At the beginning of the war the British Navy possessed seven mine-layers, all old cruisers converted for the purpose. There was talk even in those days of submarine mine-layers, and when the Germans found that they were not able to use surface ships for the purpose as freely as they would have liked, they set to and built submarines for the purpose. The UC 5, which was captured and exhibited in the Thames, was one of these. She carried the mines in pairs in six well-holes, one behind the other, in the forepart of the ship. The lower of each pair of mines had to be dropped before the upper one could move, and all of them were released by a simple lever in the conning tower.

The antidote to the mine-layer is the mine-sweeper. The need for the organisation of flotillas of sweepers was foreseen by the Admiralty some time before the war broke out, and a special trawler reserve was formed,



GERMAN SUBMARINE MINELAYER U C 5

which grew very rapidly after August 1914. All sorts of vessels have been used for sweeping, and a special class of ship has been built since 1914 for this work, but the bulk of it has been done by trawlers manned by the hardy fishermen of the coast towns. No more stirring tribute to the work they have done could be paid than that in the despatch of Vice-Admiral Sir Reginald Bacon on January 12, 1916, when he said:

"More remarkable still, in my opinion, is the aptitude shown by the officers and crews of the drifters and trawlers, who in difficult waters, under conditions strange to them, have maintained their allotted stations without a single accident. The results show how deeply sea adaptability is ingrained in the seafaring race of these islands."

Here are a few typical instances of the bravery of these mine-sweepers, taken from officially published reports:

Skipper T. Tringall, R.N.T.R., trawler *Solon*, No. 55, on his own responsibility went to the assistance of the steamer *Gallier*, which had just been mined on the night of December 25, 1914. It was low water at the time and dark, and the *Gallier* was show-

ing no lights, so had to be searched for in the mine-field.

Skipper Ernest V. Snowline, R.N.T.R., drifter *Hilda and Ernest*, No. 201, carried out his duties as commodore of the flotilla of Lowestoft drifters under Chief Gunner Frankin, R.N., in a most satisfactory manner. He kept to his station in heavy weather, standing by the *Galliet* after she had been damaged by a mine.

Lieutenant W. G. Wood, R.N.R., trawler *Restivo*, No. 48, did excellent work in going to the assistance of damaged trawlers on December 19, 1914, and performed the risky duty of crossing the mine-field at low water when sent to bring in the *Valiant*, which had been disabled by a mine.

Skipper Thomas B. Belton, R.N.T.R., drifter *Retriever*, No. 223, kept to his station, marking the safe channel for shipping when all other drifters were driven in by the weather.

Here are three other stories of officers of the Navy and the Reserve which show the perils of mine-sweeping very vividly :

Lieutenant Godfrey Craik Parsons, R.N., displayed great skill and devotion to duty in continuing to command his group of trawlers

after having been mined in trawler No. 58 on December 19, 1914. On this day his group exploded eight mines and brought to the surface six more. Trawler No. 99 being blown up and Nos. 58 and 465 damaged, all in the space of about ten minutes.

Lieutenant H. Boothby, R.N.R. When trawler No. 99 (*Orianda*), in which he was serving, was blown up by a mine on December 19, Lieutenant Boothby successfully got all his crew (except one who was killed) into safety. Lieutenant Boothby was again blown up on January 6, 1915, in trawler No. 450 (*The Banyers*).

Lieutenant C. V. Crossley, R.N.R. While sweeping on December 19, 1914, three violent explosions occurred close under the stern of his ship, trawler No. 465 (*Star of Britain*). He controlled the crew, and himself crawled into a confined space near the screw shaft, discovered the damage, and temporarily stopped the leak sufficiently to enable the pumps to keep the water down and save the ship.

Out in the Mediterranean the trawlers did many things besides sweeping for mines. The officially appointed chronicler of the Gallipoli

campaign lifted the veil on some of their doings, showing how they searched the inlets of the Ægean for enemy submarine bases, and rammed anything floating that might be a submarine; how they turned themselves into nautical Carter Patersons for the army, and transported biscuits or generals, water or prisoners with glorious impartiality from the bases on the islands to the peninsula.

The main work of the Royal Naval Trawler Reserve, however, has been the new kind of "fishing," the trawling up of mines laid by the enemy in the track of non-combatant shipping.

The trawlers "fish" in pairs. Each has inboard the end of a heavy steel cable which stretches just under water several hundred yards long between them. When a mine-field is found the cable fouls the anchoring rope of the mine which I have described previously. The cable tightens up a little, just enough to give warning, and rips the mine free of its anchoring gear. It floats up to the surface and picked men fire at it with rifles to puncture the air chamber and let the sea water into it, so that it shall sink to the bottom and be harmless. They do not

FIRING AT MINES TO DESTROY THEM

usually try to hit the tiny horns and explode the mine, partly because the explosion is somewhat dangerous, but more because even a Bisley King's Prizeman would find it takes time to get a bull on such a target, and it is luck as much as skill if you do hit a horn.

CHAPTER XII

MONITORS

"SHE was unlike any other vessel ever seen in these parts, having a low freeboard almost flush with the water, a 9·2-inch in her bows and a long 6-inch astern. She looked more like a Chinese pagoda than a ship."

Thus Mr. Ellis Ashmead-Bartlett described the first monitor seen off Gallipoli.

They are, indeed, weird craft, playing a special rôle in warfare, a rôle that was only discovered after hostilities began. They have figured in the fighting in several parts of the world, however, off the Belgian coast, around the Dardanelles, and among the East African estuaries, and in every case with good results.

Monitors also are practically submarine proof.

As has been seen in the chapter on mine-

layers, mines are always set to lie a certain distance below the surface so that they shall be invisible to any vessel approaching the mine-field. It stands to reason then that any ship of very shallow draft, one in fact that floats on top of the water instead of cutting its way through it, is little likely to touch a mine. In the same way a torpedo generally runs at some distance below the surface in order that its propellers may have plenty of water to grip as they revolve. Thus, again, the shallow-draught ship is quite likely to be missed entirely by the torpedo, which will pass right underneath it without hitting anything and consequently without exploding. Furthermore the shallow-draught ship can move about in shoal water where the submarine can only venture if she is prepared to work on the surface and run the risk of the other ship's guns.

The attention of the Admiralty was drawn to the possible utility of this class of ship very soon after the war began. At that time three monitors were building in England for the Brazilian Navy. They were intended to work in the shallow waters of the Brazilian rivers, but, as is always the case of contracts

signed by the British shipbuilders in the case of warships constructed for foreign powers, the Admiralty had the right to requisition the ships and pay the contract price to the Power which ordered them.

The Admiralty were not slow to make use of this power, and so we got the *Mersey*, the *Severn*, and the *Humber*. On October 17, 1914, they were in active service, working off the Belgian coast in conjunction with a miscellaneous squadron of old battleships, cruisers, and destroyers, and among them they stopped the rush of the German troops along the coast.

Enemy submarines continually tried to harry the squadron, but without serious results.

The lesson of this was not lost on the Admiralty. Work was started at once on a considerable number of new monitors, and the fruits of this energy were seen in the following autumn.

A despatch by Vice-Admiral Sir Reginald Bacon, issued in January 1916, contained the names of six new monitors, and the numbers of some smaller ones, all of which were in action off the Belgian coast by the end of

August 1915, and must therefore have been built in about nine months.

Authorised descriptions of the new monitors mention 14-inch guns as among the armament of some of them, while others have 9·2-inch and 6-inch howitzers. They are not overburdened with engines, as speed is of no consequence to them, and they only carry a thin belt of armour. All their strength is concentrated in their guns. For their defence they rely firstly on their shallow draught and secondly on the fact that their works above water are as small as their under-water portion, so that they offer a very small target to the forts that they are most often employed to attack.

They are not particularly comfortable ships to live in, though they have most of the improvements that are possible, such as cold storage for food; the officers' cabins are fairly big, and as the crew is small for the size of the ship the men are not cramped.

How did the name "monitor" arise? In precisely the same way as the word "dreadnought," as applied to modern battleships. The first ship that embodied the principle of

shallow draught and heavy guns was called the *Monitor*. She was built for the United States in 1853 to fight the Confederate ironclad, *Merrimac*, and the design created a great deal of discussion, although the ship herself never did much and ended her career ingloriously by capsizing in a sea-way. The idea took root, and ever since there have always been a few monitors in one or other of the world's fleets, although their use has been confined to the comparatively calm waters of the big rivers.

The monitor, in fact, can never be more than a floating fort; she can never be a battleship, because the design does not allow space for engines of sufficient power. The monitor would be useless to any power that had not the command of the sea to allow it to send the practically defenceless shallow-draught ship to bombard the enemy's coast under protection of her own battle squadrons. It is a significant fact that we heard nothing of any German monitors during the war. German bombardments of the British coast had to be carried out by fast battle-cruisers that could escape if they were attacked.

The monitor is only an adjunct to a fleet, built for one special object of offence, and not available for the general purposes of fighting at sea.

CHAPTER XIII

MY LORDS OF WHITEHALL

THE Navy is governed by a board of directors, some of whom are appointed for political reasons, some because they are naval officers of standing and experience, and one at least because he is a business man.

One does not hear much talk about red-tape at the Admiralty among the general public. That may be in part because of the inherent loyalty of the Englishman to the sea service, which would forbid him to cast a stone at it. It is more due to the fact that nearly every head of a department is a naval officer who is only in office for a while, who comes fresh to the desk from command afloat, with all the seaman's adaptability and push, and who is off again to sea to be replaced by another naval officer before the toils of Civil Servantism have had time to coil round him.

This is not a history of the Navy, so I am not concerned to show how the old Admiralty and the Navy Board came by degrees to be amalgamated. I am not concerned with the evolution of the historic Lord High Admiral. I am not concerned to show you the peculation and the fine solid work done in the days when old gossip Pepys was administrator of the Navy. The Board of Admiralty in the twentieth century is my sole topic here.

There are nine members of the Board and the work is divided among them thus:

First Lord.	General direction, and particularly political business. Appointments of admirals and officers in command of ships. Promotions, honours and rewards.
First Sea Lord.	Preparations for and direction of war operations. All the large questions of naval policy. The fighting and sea-going efficiency and strength of the fleet. Superintendence of the War Staff.

Second Sea Lord.	All questions of Personnel. Junior officers' appointments. Questions relating to the Marines, the Coastguards and the Reserves. All matters of discipline, and general superintendence of hospitals and the signal service.
Third Sea Lord.	Questions relating to the design and construction of new ships or those purchased or hired, including machinery, guns and armour. Docks. The Air Service, material and inventions.
Fourth Sea Lord.	Matters relating to stores, coal and victualling. Pay and pensions, medals, uniforms. Transport.
Civil Lord.	Staff questions so far as they relate to civilian employees. Superintendence of land works and buildings.
Additional Civil Lord.	General supervision of all contracts in their business aspect, and the control of dockyards as business concerns.

Parliamentary and Financial Secretary.	Finance and all matters concerning the Treasury.
Permanent Secretary.	Control of the whole Admiralty staff and procedure.

This allocation of business must not be assumed to be absolutely water-tight. All departments overlap into each other as occasion requires.

There is in the working of the Admiralty all that flexibility which is the hall-mark of the successful business organisation, and there is also that delegation of power which makes possible decisions of the utmost weight at any hour of the day or night. It is expressly laid down in one Admiralty Memorandum that in the absence of the First Sea Lord for any reason the Second Sea Lord acts for him. The principal members of the Board, moreover, live at the Admiralty, the First Lord at Admiralty House, and the First Sea Lord in the new building on the right-hand side of the great memorial archway into the Mall. They are, like doctors, always at call.

The departments which work under the

various members of the Board are far too numerous to be described in detail. Most of them are fairly obvious, such as the Secretary's Department, the Navigation, Equipment, Construction, Stores and Ordnance Departments. There is also, of course, the Department of the Engineer-in-Chief, the Contract and Purchase Department, Works, Transport, and Accounts. There is a special compass branch, and the work of navigation also throws on the Admiralty the maintenance of the observatories at Greenwich and at the Cape of Good Hope, the publishing of the Nautical Almanac, and the very important surveying work of the Hydrographic Department.

I once amused myself in digging out of the 270 or so pages of statistics that formed the Navy Estimates before the war some particulars of the many odd things that are paid for out of the Navy Vote. Under the wages for officers and men I found an item of £250 for a farm bailiff, civilian. He was in charge of the farm at Ascension Island, and in the vote for miscellaneous services was an item of live-stock for this farm. There was a sum of £3494 solemnly voted by the House of

Commons for the payment of 94 charwomen to keep the Admiralty clean.

There was one sub-head, however, which eclipsed all the others for concentrated essence of the unexpected: it ran thus:

"Contingencies: Funerals by contract or arrangement (including coffins); compensation for loss of burial fees; refunding tolls payable for bridge from Gosport to Haslar; chapel allowances; carting rubbish; amusements of lunatics at Yarmouth, and other small expenses, £2100."

Compared with that the meticulous accuracy of the accountant who worked out the wages of certain marine bandsmen to £29 5s. 6½d. per annum was banal.

These things, however, are all part of the price of Admiralty, as important to the smooth running of the Navy in their way no doubt as the proper organisation of the War Staff.

This Staff only came into existence officially in 1912, but it had always existed, in spirit if not in name, in the Intelligence Department. The War Staff nowadays, however, consists of four divisions—operations, intelligence, mobilisation, and trade

—and its task has been officially explained thus :

" It is to be a brain far more comprehensive than that of any single man, however gifted and tireless and unceasing in its action, applied continuously to the scientific and speculative study of naval strategy and preparation. It is to be an instrument capable of formulating any decision which has been taken, or may be taken, by the executive in terms of precise and exhaustive detail."

In a word, it has to make plans.

The good effect of the formation of this War Staff, and of the Naval Staff College, which was a corollary to it, has been seen more than once during the war.

The dockyards are a branch of naval administration that may be conveniently studied here.

Dockyards exist to serve many purposes. They are ports of call for ships on active service, where fresh fuel and stores and victuals may be obtained. They are havens of refuge for ships damaged by storm or accident or battle. They are factories for the making of new ships. And they are also general marine

store dealers. In any dockyard, even the smallest, one is invariably struck by the immensity of energy that is expended on the little jobs, and by the complexity of the organisation by which a modern fleet is kept in fighting trim.

On one of my visits to a British yard during the war I saw a long, low, rust-stained hull of a destroyer in one of the basins. She was gutted—no smoke-stacks, no cowls, no guns showed on her deck, which was torn open in many places. Her bridge was only a skeleton, her forecastle was a sloping spray-stained waste.

Two hundred men had seized hold of her and were beating her about with hammers and chisels and a score of contrivances like exaggerated dentistry implements. She looked as though she had been through the worst inferno of a modern naval battle and had just escaped with her skin. In reality she was only there to have her boilers re-tubed, a six-weeks' operation that would send her to sea once more a thirty-knotter, despite her twenty years, fit to sink any U-boat at sight.

At Queen Victoria's Diamond Jubilee that

dirty hull was one of Britain's show ships. A peace-time Navy would have had no further use for her. War has different standards, however, so the yard put new tubes into her boilers with a mighty clanging by day and by night, slapped another suit of paint round her rusty plates and then lordly Whitehall condescended to allocate a new crew to her when the yard reported, "All correct"; and so the old ship could once more "Carry on."

Trawler mine-sweepers have a way of knocking themselves about in the country's service, and then they have to run to one of the yards to be nursed back to health. I walked into the foundry and stood there a few minutes watching the welding of a new tip to a propeller blade—the careful workman patting down fine soft earth into a mould as a child pats seashore sand down into his little bucket; another man, an artist in his way, sweeping careful fingers up and down the rough outline of the new blade, pushing a fragment of mould further in here, brushing off a fragment there, until the whole thing was sculptured to perfect proportions.

Then I passed into the machine-shop with its roar and clang, as the great lathes turned

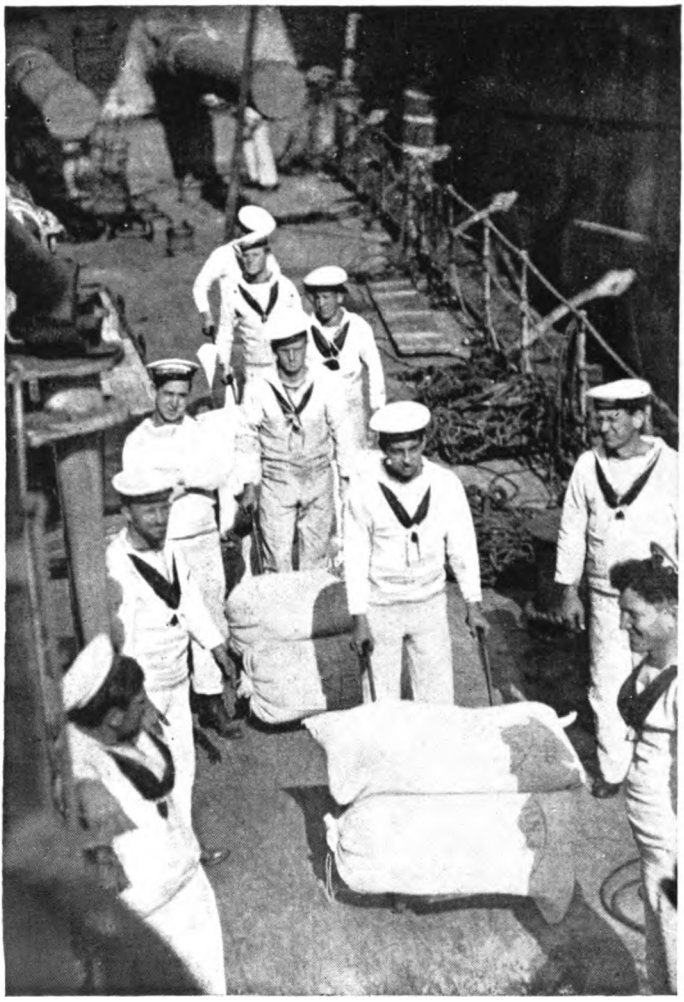
new torpedo-tubes and giant drills cut hundreds of teeth into the bronze bases on which the above-water tubes were to stand. Then I passed quite suddenly into the silence and tar-laden atmosphere of the old Navy—the rigging shop. Even in these days hemp and canvas still plays a large part in the subsidiary service of the Navy.

The long, low-ceilinged avenue of a room, once a rope-walk, was packed with wire hawsers as well as hemp cables. There were great eight-inch hawsers for salvage work, as when a submarine sinks to the bottom. There were the fat comfortable-looking "fenders" that are squeezed between the quay-side and the ship's precious paint when she sidles up to her berth. In a corner a group of women sat round a low bench, and in their hands small strands of wire flicked in and out, like the legs of some giant spider in its death-throes, and when the flicking ceased I saw that all those thin strands had been tightly spliced into a single cable. Women's wrists are not strong enough to tackle anything much larger than a two-inch wire, so the heavier stuff has to be left to men.

Work in the rigging shop is largely done by

women nowadays. There is the old colour-room where women have made flags for the Navy for half a century past, women who are widows or dependents of dead Navy men. In other directions the introduction of woman labour was due to the war. There were many of them, for example, sitting at magnified sewing machines that ran by mechanical power, and making a noise as they sewed like a Gatling gun with a sore throat. These women were sewing up asbestos-cloth covers for one of the Navy's war-time needs—splinter mattresses. The core of the mattress is a two-inch thickness of felt. That is covered round with a fine-mesh wire-netting and then the whole thing is slipped into a cover of asbestos cloth and sewn up, with canvas handles at either end, ready to be placed round the bridge and the exposed gun-positions of a destroyer or of an armed trawler to stop splinters of shell. Hundreds of these mattresses were produced every week and sent off to the ships at sea.

Then in other parts of the yard there were electrical shops, where, among other things, all the delicate work of maintaining the under-water working of submarines was carried on.



FLOUR BEING TAKEN ON BOARD THE DREADNOUGHT

There were great store-houses full of everything that a ship can want when she puts to sea, and how extensive those wants are very few people outside the Service ever realise. I once compiled a list of some of the items of provisions carried in a battleship, and the following are a few specimen amounts :

Spirit . .	10,800 pints	Jams . .	6,240 lbs.
Biscuit .	6,600 lbs.	Sugar . .	20,000 lbs.
Flour (all sorts) .	64,200 lbs.	Tea . . .	2,600 lbs.
Corned beef	7,560 lbs.	Coffee . .	2,800 lbs.
Salt pork .	5,500 lbs.	Rice . . .	1,800 lbs.
		Raisins . .	960 lbs.
		Mustard .	340 lbs.

In addition there were 3,000 tons of coal, miles and miles of electric wire, hundreds of electric-light bulbs, wireless gear, the myriad tools required by the engine-room complement, the armourer's crew, the blacksmith's crew, and the carpenter's crew; furniture for the officers' quarters and the men's mess decks—the kitchen utensils alone are an enormous item in a ship that carries 900 men —seamen's bags, bunting, hammocks, linen, soap, holystone—the list is almost interminable. But the dockyard must be ready to supply them all at need, and someone in a

little office in Whitehall must check their issue and their use. For the running of the Navy is a gigantic commercial undertaking as well as a national necessity. We must always be prepared, down to the last lump of sugar.

CHAPTER XIV

COMMISSIONED OFFICERS

AT which end of the scale is one to begin any explanation of the relative ranks, work and distinguishing marks of the officers of the Navy?

When one has moved about among naval officers and men for a good many years, one comes imperceptibly to know who the man is who has three rings of gold braid and a curl at the top; what branch the man belongs to whose rings are separated by lines of red or purple cloth; why this sailor wears crossed Indian clubs on his arms, and that one has a queer thing that looks like an ace of clubs. When it comes to explaining all these things, however, it is far from easy.

Perhaps the following tabular arrangement will be as clear as any that can be devised:

Buttonhole of white twist on each side of the collar.	Naval Cadet.

White cloth patch 2 ins. long on either side of the collar.	Midshipman.
One row of gold lace with a loop on the cuffs.	Sub-Lieutenant and Mate.
One row with no loop.	Assistant Paymaster.
Two rows with loop.	Lieutenant.
Two rows thick, one thin and loop.	Lieutenant-Commander.
Two rows thick, one thin, without loop.	Staff Surgeon, Staff Paymaster and Naval Instructor.
Three rows thick with loop.	Commander.
Three rows thick with no loop.	Fleet Surgeon, Fleet Paymaster and Naval Instructor.
Four rows thick with loop.	Captain.
Four rows thick without loop.	Deputy Surgeon-General and Paymaster-in-Chief.
One band treble-thick with loop.	Commodore.
One band and one row thick with loop.	Rear-Admiral.
One band and one row thick without loop.	Surgeon-General.
One band and two rows with loop.	Vice-Admiral.
One band and two rows without loop.	Medical Director-General.

One band and three rows with loop.	Admiral.
One band and four rows with loop.	Admiral of the Fleet.

The executive officers have no distinguishing colours between the rows of gold lace. The other branches are distinguished thus :

Purple	Engineers.
Scarlet	Medical.
White	Accountant.
Light blue	Naval Instructor.

Royal Naval Reserve officers wear the same uniform, according to their rank, as the naval officers, but with a few small differences. The most noteworthy of these is that the lines of gold lace on the cuff are formed of wavy lines instead of straight ones. R.N.R. midshipmen have a buttonhole of blue twist either side of the collar instead of a white patch.

The Royal Naval Volunteer officers' gold lace is also waved, but thinner than that of the R.N.R. The R.N.V.R. midshipman's collar patch is a buttonhole of maroon twist.

What I have called the loop, though its technical name is the curl, was only worn

by the military (or executive) branch of the Navy until Christmas 1914, when the Admiralty suddenly conceded to the engineer branch the right to wear it, a right that had been agitated for during more years than most of us can remember, and, as the engine-room departments have shown many times since, they more than deserved the honour. Lord Fisher expressed it very neatly when he said:

"The unapproached efficiency of our engineers in the Navy merited this tardy recognition of their all-important part in the present splendid fighting condition of our whole fleet."

This branch has the same titles of rank as the military branch, preceded by the word "engineer," e.g. Engineer Rear-Admiral, who will have one band of gold lace, treble thick, and one row thick with a loop, and between the band and the row a narrow band of purple cloth. There are no engineer midshipmen or cadets.

Sir Christopher Cradock, who perished in the *Good Hope*, used to tell a good story, showing that an engineer was not necessarily without the fighting instinct.

"The most efficient boat in the submarine flotilla at Portsmouth was once navigated to her berth in a strong tide with only one engine-room artificer and a stoker to assist the captain.

"The engine-room artificer's trade union spoke to him about it afterwards. His reply was:

"D—n the union. The other men said we couldn't do it."

The layman is occasionally puzzled by hearing two classes of officers spoken of—wardroom officers and gunroom officers. The distinction is purely one of age and seniority of rank. It is manifestly not politic that the young boys, such as midshipmen and sub-lieutenants, should be brought into the social life of men many years older. They work together, but in off-duty times they live separately, though the wardroom mess—the older men—now and again ask the gunroom mess to come round for a sing-song, or vice versa.

The best way to explain the work of the officers of each grade is to take an imaginary boy and trace his life as a naval officer.

At the age of thirteen he goes to Osborne,

the naval college in the Isle of Wight, as naval cadet and spends two years there in getting general schooling, a certain amount of engineering instruction and a grounding in nautical knowledge. Most important of all he imbibes the tradition of the sea service, for although there are many schoolmasters on the staff, the college is run by naval officers with naval routine. From Osborne he goes to Dartmouth, still as a cadet, and has two years' more instruction. Then after a six-months' training cruise he passes his examination for midshipman.

As a midshipman in a big ship at sea he assists the officer of the watch, unless detailed for special duties such as signal midshipman, and acts as junior officer of a "division" of men. He has one of the ship's boats under his charge, and picks up a lot of practical navigation in her, with the help of his coxswain, a man often old enough to be his father.

After another examination he qualifies as a sub-lieutenant, and if he is appointed to a torpedo-boat, he will become second-in-command of one of His Majesty's ships at the mature age of nineteen and a bit. If he goes

into a big ship, however, he will still be one of the small fry.

His next step is into the rank of lieutenant (and up to the wardroom), and then he begins to branch out into one of the special lines—gunnery, torpedo, navigation, engineering, or signalling. Or if he is not particularly anxious to specialise he becomes a "watch-keeper,"* which means that he has no specialist knowledge, but is an all-round man whose principal work is to look after the safety of the ship in harbour and at sea.

* Very few landsmen ever solve the mystery of the watch at sea, though it is really not difficult.

Night and day are divided into equal periods of four hours each. At night we get:

First watch 8 p.m. to 12 midnight.

Middle watch 12 a.m. to 4 a.m.

Morning watch 4 a.m. to 8 a.m.

The day watches are similarly divided, but are not named beyond being distinguished as forenoon and afternoon, while the watch from four p.m. onwards is divided in two, the period from four to six being called the first dog-watch, and the period from six to eight the second dog-watch.

To reckon time as told by the ship's bell it is only necessary to remember that "one bell" is the first half-hour after the watch begins, and that one more stroke is added for each half-hour that passes. Thus six bells in the middle watch will be six half-hours after midnight—or three a.m.

After eight years in this rank he becomes a lieutenant-commander (two and a half stripes being his badge on the cuff), and in this rank his specialist knowledge is brought into full play. If he is a gunnery man he has charge of all the firing in the ship. If he is a torpedo man he looks after the work of the "tin fish," and also the electrical installation in so far as lighting, searchlights, telephones, and wireless are concerned. If he is a navigator it is his work to take control of the safe navigation of the ship, though technically, of course, the captain is responsible for that as for everything else in every other department.

It is when he reaches the rank of commander that the naval officer's trials really begin. The commander in a big ship is the busiest man in the world. His specialist knowledge is more or less shelved. He is the general manager. He is the buffer between the captain and the whole ship's company. He sees every signal that comes into the ship and goes out. He is responsible for every evolution, such as Fire Stations, Collision Stations, General Quarters, and a dozen more complex drills for the crew. He

is the unfortunate man who has to see that the eight or nine hundred men who have their home in that ship keep it clean, and behave themselves. He deals out minor punishments, reserving more serious cases for the "Captain's Defaulters'" list. If the Captain is out of the ship for any reason the whole responsibility falls on the commander's shoulders. He wears three stripes on his sleeve, and it must be with a sigh of relief that most men add the fourth stripe which means they have reached the comparatively quiet waters of a captaincy.

The captain lives a solitary life, it is true. He is not a member of the wardroom mess. He has his meals in his own cabin, unless he invites one or other of his officers to dine with him, as most captains make a rule of doing. The captain is absolute master in the ship, unless he is a flag-captain in an admiral's ship, and even then he is in complete control of the actual working-life of the ship, with the added responsibility of squadron routine to attend to.

Commodores are never classed separately in the Navy List, for some reason or other. They retain their places in the list of captains,

and because a man is a commodore it does not follow that he will become a rear-admiral before a captain who is senior to him, but who still only has four stripes instead of the thick band. "Commodore" is more or less an honorary distinction bestowed on a man who holds a post of some responsibility that is not important enough to give to an admiral, but which yet demands the presence of an officer of more distinction than a simple captain. Officers in command of light-cruiser squadrons are an example.

And here it is necessary to point out a curious feature about naval promotion. Up to and including the rank of captain all officers are promoted solely by selection at the discretion of the Admiralty. An extreme instance occurred in the case of Captain Nasmith, V.C., the hero of E 11. He was promoted to the rank of commander in June, 1915, over the heads of 434 lieutenant-commanders who were all senior to him, and at midsummer 1916 he was again selected for promotion from commander to captain over 429 more officers who were his seniors.

Henceforward, however, all promotion for him and the other men in the captains' list

goes purely by seniority. As vacancies occur in the flag-list (as the list of admirals is called) so the captain at the head of the captains' list will "get his flag," i.e. be promoted rear-admiral. Selection ceases after the rank of commander has been passed until we reach the topmost rung of all, the Admiral of the Fleet. They are selected at the personal wish of the King.

The three lower grades of Admiral—rear, vice, and full—offer no difficulties. Certain commands are only open to the junior flag-officers, certain commands are by tradition associated with men in the senior rank. The work of them all is the same in essence: they are divisional commanders.

The origin of the term "flag officer" and "flag list" lies in the fact that an admiral, of whichever grade he be, has the distinction of flying his personal flag in the ship in which he is serving. The flag of a full admiral is the plain St. George's Cross on a white ground. The vice-admiral has the same, but in the top left-hand square of white there is one red ball. The rear-admiral's flag is the St. George's Cross on a white ground with a red ball in top and bottom left-hand squares (next to the

flagstaff). The Admiral of the Fleet flies the Union Jack at the mainmast.

The engineer officers are concerned, naturally, only with the engineering side of the ship's work. They do not undertake navigation duties, and engineer-captains at present are not qualified to take command of a ship. They hold only staff positions on the staff of an admiral in command of a squadron, to look after the engineering departments of every ship in the squadron. Nor do engineer-admirals command squadrons at sea. Their work is confined to office duties on shore.

The duties of the medical officers require no special description, though they merit, in common with all the other non-combatants who make up the ship's company, a special tribute. There is no Red Cross at sea. Every man in a ship that goes into action, goes to his death if the ship is sunk. Doctors, chaplains, accountants, all take equal risks with the fighting men, and take them cheerfully, knowing that there is always a job of work in their own particular line to be done on board ship, and if they didn't do it someone else would have to.

These then are the ranks and some of the

duties of the officers of the British Navy. Hundreds of them have met their deaths doing their work during the war. All are mourned, but to the student who looks into the future the most pathetic feature of the honour list is the terrible toll that has been taken of the younger generation—the cadets, the midshipmen, and the sub-lieutenants.

Shortage of naval officers is one of the consequences of the war that must be faced betimes. The training is not a matter of months, but of years, and if, which Heaven forfend, our losses in naval engagements throughout the war are to be on the same scale as they were during the first two years, our available quarter-deck (or officer) personnel in ten years' time will be far short of our requirements.

The Admiralty will need to tackle the question of the supply of naval cadets without delay, and it seems almost inevitable that a wholesale reduction, if not, indeed, the total abolition of fees for training paid by parents at present will have to be introduced. One has only to look at the great number of temporary commissions in the Navy, issued to civilian engineers alone when war broke

out, to recognise that the supply of naval officers in ordinary times is not equal to the demands of abnormal times, and to recognise that there is a great field untouched for the recruiting of naval officers.

The training of a naval cadet occupies about 8½ years, from the age of thirteen. By the time he is twenty-two the young officer is probably earning 35s. a week, or if he is in command of a torpedo-boat he may be receiving as much as 49s. a week. To gain the knowledge fitting him for that post—in a word to serve his apprenticeship—has cost his father between £550 and £750 at the very least.

It is a pretty stiff premium. One admits readily enough that the boy may rise to be an admiral, a baronet and a maker of Empire with emoluments amounting to about £3300 a year. But he is far more likely to retire as a commander on a pension of £400 a year, without even an M.V.O. to his name.

The fees at the Osborne and Dartmouth Training Colleges for three-quarters of the boys trained there amount to £75 a year. Extras each year total at least £22. There is the uniform and outfit, the initial cost of

which is £35, and in the case of a growing boy constant replacements are necessary.

There are reduced fees of £40 a year for a quarter of the cadets at the colleges, all of them sons of naval or military families.

A recent Admiralty order arranges for an extension of this privilege to sons of naval and military men who have lost their lives in the war, by the formation of a body of "King's Cadets," who will pay no fees, will not be dependent on their parents for allowances, and will receive free kit on entry. This is the beginning of a reform which one hopes to see very shortly extended to cover a much larger class of eligible boys.

When the cadet leaves the college and goes afloat, becoming in the course of six months a midshipman, the college fees end, but the parents are then compelled to begin payment of the allowance of £50 a year. This continues for 3½ years until, after passing through the rank of acting sub-lieutenant, when the compulsory allowance is £20 a year, he blossoms forth as a full sub-lieutenant and is thenceforward nominally independent of his family.

What does the nation save each year by

thus compelling patriotic parents to pay for their patriotism? As nearly as possible the amount is £180,000, the price of one torpedo-boat-destroyer, twenty of which are voted without a division every year by Parliament. In other words a penny-farthing contribution by all the taxable inhabitants of the country would pay the annual cost.

If fees were abolished the result of thus throwing open the doors of the Navy would be a large influx of boys of just the right type who now, by reason of their parents' inability to shoulder the burden of the fees, are excluded from the service. I refer to the sons of civil engineers, electrical engineers, and marine engineers, whose practices are not large, to the hundreds of country clergymen, barristers, and doctors of good family and fighting traditions.

Money is a poor test of a boy's ability to command a man-of-war. Nelson was the son of an underpaid country parson: Collingwood's family was in reduced circumstances owing to its earlier devotion to the cause of the Stuarts: of Anson's early life and education the biographers know nothing. Shovel was to have been apprenticed to a shoe-

maker and ran away to sea: Benbow's father held a "small office in the Tower, barely sufficient to afford him and his family a scanty maintenance." Drake was born in a humble cottage near Tavistock, the son of a simple coastwise trader.

The institution of fees for the training of naval officers dates from the Victorian era. How many Drakes and Nelsons has the Empire missed in the past half century since the establishment of the *Britannia*?

CHAPTER XV

OTHER OFFICERS AND MEN

THE life and work of the warrant officers, petty officers, and men of the Navy are so varied that nothing short of a thick volume could tell the full story. There are, for example, nine different "rigs" or sets of uniform for wear by the lower deck, ranging from the No. 1 serge jumper with serge trousers to No. 9, the overall suit worn for coaling ship and other dirty work. There are some scores of badges denoting various ranks and qualifications, but I have concentrated them down in the following table :

Crossed gun-barrels.	Gunners.
Crossed torpedoes.	Torpedo Man.
Crossed flags.	Signalman.
Wings pierced by lightning.	Telegraphists.
Crossed rifles.	Good shooting badge.
Crossed Indian clubs.	Physical training instructor.

Propeller (like an ace of clubs).	Mechanician or Stoker.
Crossed hammer, hatchet and gun.	Armourers.
Crossed hammer and hatchet.	Blacksmiths, Plumbers, Carpenters, Shipwrights and Artificers.
Crown, supported by letters "N.P." on either side.	Naval Police.
Gold star.	Schoolmasters, Ships' Stewards and assistants, Writers.
Red Cross in a Circle.	Sick Bay Staff.
Bugle.	Buglers.

Each of these branches has additional marks of rank.

Thus, crossed gun-barrels surmounted by a crown and with stars between the barrels indicates a Gunner's Mate and Gun-layer First-Class, the highest rank of all under warrant officer. It may be taken as a general rule that the crown and stars indicate that a man is first-class at his job.

The following badges of rating are most often met with and should be remembered :

Crossed foul anchors surmounted by a crown.	Petty Officer.

Single foul anchor upright.	Leading Seaman, Leading Signalman.
Single stripes at a slight upward angle.	Good conduct badges.

The warrant officers, who are, generally speaking, the oldest and most trustworthy of men in the service, wear a uniform rather like the undress uniform of officers, but without rows of gold lace on the cuff. They have three gold buttons there instead. Warrant officers are the Boatswain, the Gunner, the Carpenter, and the Warrant Telegraphist.

The chief petty officers are the head men at the various jobs: gunnery, torpedo, physical training, police, signals, engine-room artificers, writers, and so on.

Boys are entered in the Navy between the ages of 15½ and 17. They must be good boys, physically and morally. The Navy has no use for the outcasts of prisons and reformatories, though there are some ignorant magistrates who still seem to imagine that the men who defend the Empire are anxious to consort with criminals. It used to be said in the old days of the press-gang that our Navy was manned by jail-birds, and that local magnates were glad when the "press"

officer came round, for they could hand on to him all the undesirable characters of the neighbourhood. That is no longer true. Even boys from industrial schools are only accepted if they bear very good characters and are personally entered by the Admiral of the Training Service.

The following table shows the physical standard for boys of various ages, but specially desirable boys of good physique and education are occasionally entered a little below these standards:

Age.			Height. ft.	ins.	Chest. ins.
15½	and under	15¾	5	1	31½
15¾	,,	16	5	1½	32
16	,,	16½	5	2	32½
16½	,,	17	5	2½	33

Boys who are under seventeen years old must have the written consent of their parents or guardians when they offer themselves to the naval recruiting officers, and in every case the boy must have a birth certificate or a sworn declaration of his age made by his parent before a magistrate. The boy undertakes to serve in the Navy for twelve years from the time he reaches the age of eighteen.

What happens to a boy who has been

accepted by the naval recruiting officer in his own neighbourhood? He is sent free of cost to himself or his parents to a naval depot or training establishment either at Devonport or Harwich, where he is rated as a Boy 2nd Class and receives pay at the rate of 3s. 6d. a week besides his free kit and free rations. That is to say, he is apprenticed to the Navy, and like all apprentices receives just a nominal wage until he has qualified. As showing how rapidly a boy can progress, however, it must be noted that the official regulations state that boys can, after three months' service, send money home to their parents or guardians at the rate of eight shillings a month free of expense.

Boys who join the Navy do not need any outfit from home. They receive the following articles free:

Two jerseys, three pairs serge trousers, three pairs duck trousers, two shirts, four flannel shirts, two pairs socks, two caps and ribbons, one pair boots, one pair shoes, two serge jumpers, two pairs woollen drawers, two towels, one bed, one blanket, two bed covers.

The boys lead a splendidly healthy life

while training, and are well fed. They have biscuits and cocoa as soon as they turn out in the morning. Breakfast is at eight o'clock, when they have coffee or tea, porridge on alternate days in winter, bread and butter, and a meat dish or fish. Dinner is served at noon and consists of joint, potatoes, at least one green vegetable, and a substantial pudding of the kind boys enjoy. Tea is at four o'clock, with cake or bread and butter and jam or marmalade or some other preserve. For supper at seven o'clock there is cocoa and bread with either cheese and pickles, cold meat, saveloys, or fish cakes.

As they begin, so they go on. The feeding of the New Navy is vastly different from what it was in the Victorian era. Some of the older hands who remember the nineties rather sniff at "new Navy" methods of marmalade and such kickshaws for the lower deck, but the feeding of the men in the Navy to-day is arranged on rational lines, and weevily biscuit and stale water are only to be found in the pages of Captain Marryat.

Boys who enter as seamen are trained for one of three branches: the advanced seaman branch, the signal branch, or the wireless

telegraphy branch. Boys who want to be engineers enter the Navy under a different system, which I will describe presently.

Bright boys can be rated as ordinary seamen before they are eighteen, after having passed through the intermediate stage of Boy, First-Class, a rank around which much glamour has been thrown during the war by such heroic deeds as that of Rogers of the *Tiger* and Cornwell of the *Chester*. Ordinary seamen receive pay at the rate of 8s. 9d. a week, with the usual sevenpence a week for each good conduct badge. By this time, of course, the boy is at sea on board ship, and thenceforward he progresses, according to his conduct and ability, through the following stages :

Able Seaman	Pay 11/8 a week.
Leading Seaman	15/2 to 16/4 a week.
Petty Officer	21/– to 23/4 a week.
Chief Petty Officer ..	25/8 to 30/4 a week.

The next grade is warrant officer, whose pay ranges from £109 to £164 a year, and that rank can be reached by a clever lad by the time he is twenty-five. In that case he will find the way open to him to a commission.

If he has impressed his captain favourably he will be recommended for advancement to the rank of Mate and will have to take a college course ashore in order to qualify. He will first become an acting-mate, ranking in seniority with the sub-lieutenants, but, owing to his age, messing in the wardroom with the older officers. His pay will be 8s. a day with a messing allowance of 2s. a day, and in order that he may buy the necessary uniform he is allowed a gratuity of £50. After he has been confirmed in the rank of mate he is eligible for promotion to the rank of lieutenant, and although this system was only introduced a very few years ago there are already lieutenants in command of British men-of-war who originally were ordinary seamen.

The engineering branch of the Navy is mainly recruited from youths who have already reached the age of twenty-one. There are, however, a certain number of entries of boys each year to be trained as engine-room artificers, and these boys, like the others, have the chance of rising to be engineer-lieutenants. Boys who enter this way, however, must be between the ages of fifteen and sixteen when they enter, and entries are only

accepted in January and July of each year. The conditions are very stringent, and the boys must have special ability, or be relatives of men in the service or in the dockyards, to be accepted, though the county educational authorities have also the right to nominate a few specially bright boys from their schools. Engine-room artificers rank as chief petty officers, and their pay starts at 38s. 6d. per week, though naturally the boys who are training are not paid that amount while training.

Stokers are not entered before the age of eighteen. The pay begins at 11s. 8d. a week, and rises in the case of chief stokers, with twelve years' service in that rank, to 40s. 10d. a week, while stokers who show mechanical ability may be drafted to the mechanician branch and become commissioned mechanicians with pay that reaches £246 a year.

No book dealing with the Navy could be complete that contained no particulars about the Royal Marines.

This corps of amphibious fighting men is divided into two parts, the Royal Marine Light Infantry and the Royal Marine Artillery. The former are known as the Red Marines

and the latter as the Blue. They provide the sentries on board ship, outside the captain's cabin, the wardroom, the cells, and elsewhere. The officers' servants and the postman are selected from the marines, and on ceremonial occasions they form the guard.

Their fighting value is in their gunnery. Many of the best gun-layers and sight-setters in the Navy are Marines. Whenever it is necessary to land men from a warship for warlike operations the Marines naturally form part of the detachment, since land fighting is as much their job as sea warfare.

AFTERWORD

TWO years of war at sea ought to have taught the British people that the real significance of sea power is not only big ships but also small bills.

There has been nothing so extraordinary in the whole topsy-turvydom of the past twenty-four months as the insignificance of the sums that we have spent on the Navy and the monstrous amounts absorbed by the Army, and the amazing fact that the 350,000 seamen who form our war fleet have made it possible for ten times their number of British soldiers to fight and move and have their being in four continents and five main theatres of land war.

These factors in the war are static and lack the drama of a big push and a Jutland battle. Therefore the mind of the taxpayer is not always receptive to their meaning. It is the affair of the student to see to it that the nation at large does appreciate the rela-

tive values of sea power and land power, because in the immediate future the British Empire will be confronted anew with the task of solving the enormous problem of Imperial defence, and solving it, moreover, in the light of the experience of this war. If the lessons of to-day be misread—and they easily may be by landsmen politicians—this generation will imperil the welfare of the Empire materially, economically, and politically.

The shallow thinker may say, and, indeed, will say in scores of taprooms and at scores of dinner tables, that the problem of Imperial defence has been solved by the institution of compulsory military service, and that henceforth it will be the duty of everyone to be prepared to defend the Empire.

That, unfortunately, does not solve the problem. Germany had compulsory military service. It did not save her colonies from falling rapidly into the hands of her enemies. It did not avert from the population of the Fatherland the rigours of a blockade which, whatever else it has been, falls far short of the utmost pressure that could have been applied. It will not avert from Germany

the ultimate defeat that was her inevitable doom from the moment she defied sea power.

A nation cannot serve land and water.

A warning against the heresy that a great naval Power can also be a great land Power was uttered by no less a statesman than Mr. Balfour a year ago, when he said at the London Opera House :

" Have any of you thought, looking back over history, how intolerable would be the fate of the world if the supremacy of the sea was held by a nation who not only had military supremacy on land but intended to use its power, and avowedly used that power, for acquiring dominance over the whole globe ?

" It would be a tyranny such as we have not known. The world has been saved from it by the fact that predominance at sea has never been in the same hands as the military predominance that has more than once threatened the world."

The converse is equally true. If Britain develops into a first-class military Power and maintains her position as the premier naval Power, the common sense of the other nations will drive them slowly but surely

into alliance against her. If she becomes a first-class military Power and does not maintain her place at sea, Britain as a factor in the history of the world is finished. A balance must be struck. The mean must be found.

There is, of course, a difference between a first-class military Power and a nation prepared for defence. And it is precisely on that difference that the thoughts of the statesmen of the Empire must be bent in all considerations of the development of Imperial defence.

Wealthy as the Empire is (and its true wealth was almost unsuspected two years ago), it cannot and will not bear the burden of preparation for world dominion by land and sea.

Only posterity can decide how far the rulers of Britain were wise in 1914 in committing her to extensive military operations beside her Allies on the Continent. It is far too early yet even to debate the question. What we of the present day can decide is the extent and the expense of our preparations for defence in the near future. Sea power for an island Empire of scattered units is not only the cheapest form of defence, it is the inevitable form.

The truest word spoken in Germany in the last two years is the outburst of ex-Colonel Gaedke:

"We must bear in mind the naval supremacy of England, which our glorious victory off the Skager-Rack has not only not destroyed but has not even succeeded in shaking. This is why the struggle of the Central Empires is recommenced at the end of the second year of war with fresh fury."

The last word is not with the big battalions but with the big battleships.

LONDON,
August, 1916

BINDLE

Some Chapters in the Life of Joseph Bindle, by HERBERT JENKINS, Author of "The Life of George Borrow." Crown 8vo. Cloth, 5/- net. Inland Postage 5d. extra.

By profession Bindle is a journeyman furniture-remover, by nature he is a humorist. He discovers that a sense of humour is, like a tooth-brush, an intensely personal affair. When, for instance, he mixes alcohol with the lemonade at the Barton Bridge Temperance Fête, he alone fully appreciates the situation thus created. His environment is one of deep religious gloom. Mrs. Bindle is too intent upon the next world to see in Bindle anything but an irresponsible heathen. "Lorst yer job?" is her invariable interrogation when Bindle finds some employer too deeply soaked in commercialism to see one of what he calls his "little jokes." Bindle would sooner fight a man bigger than himself for ill-treating a horse, than go to chapel and hear his brother-in-law pray.

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